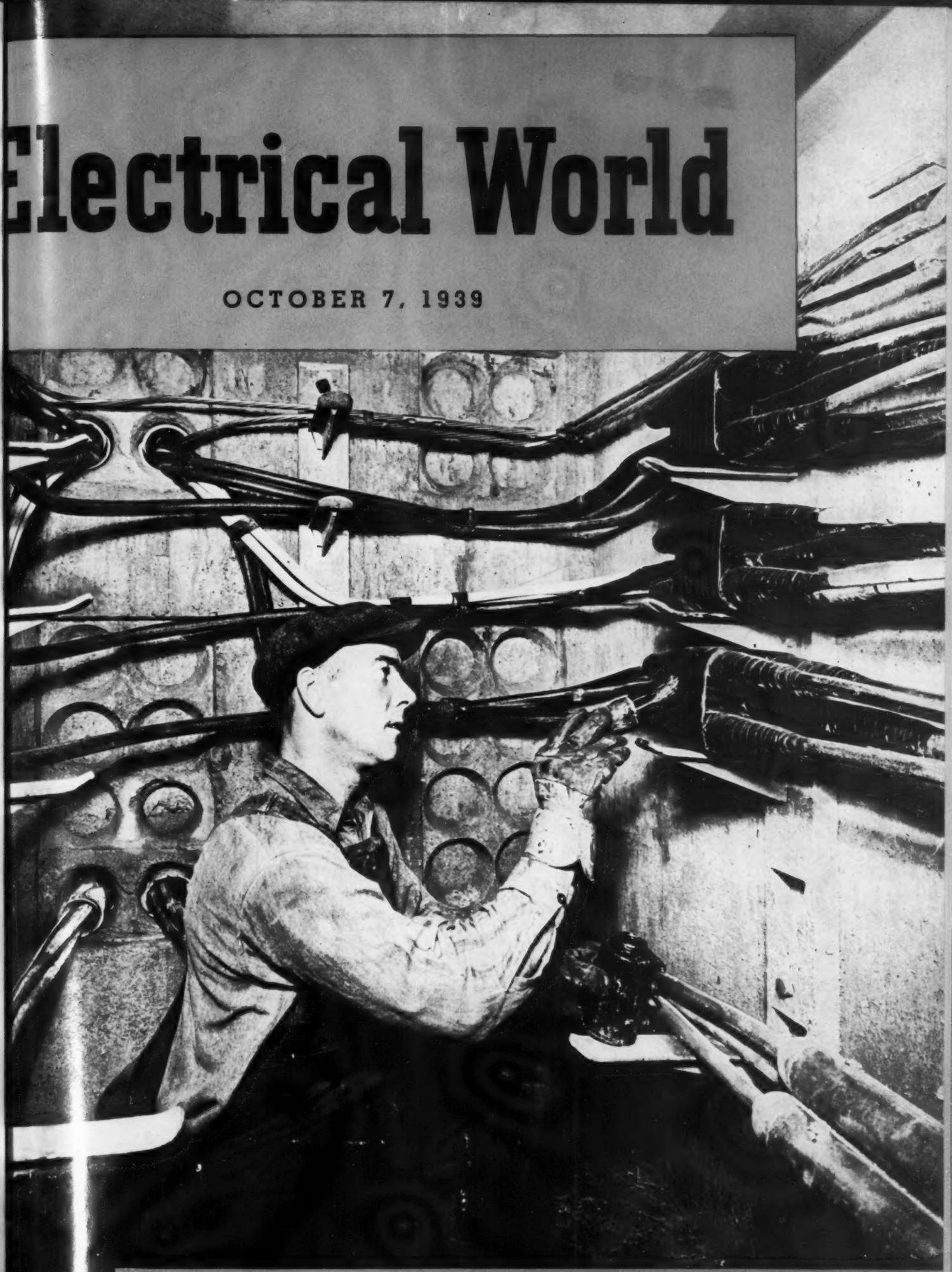
Electrical World

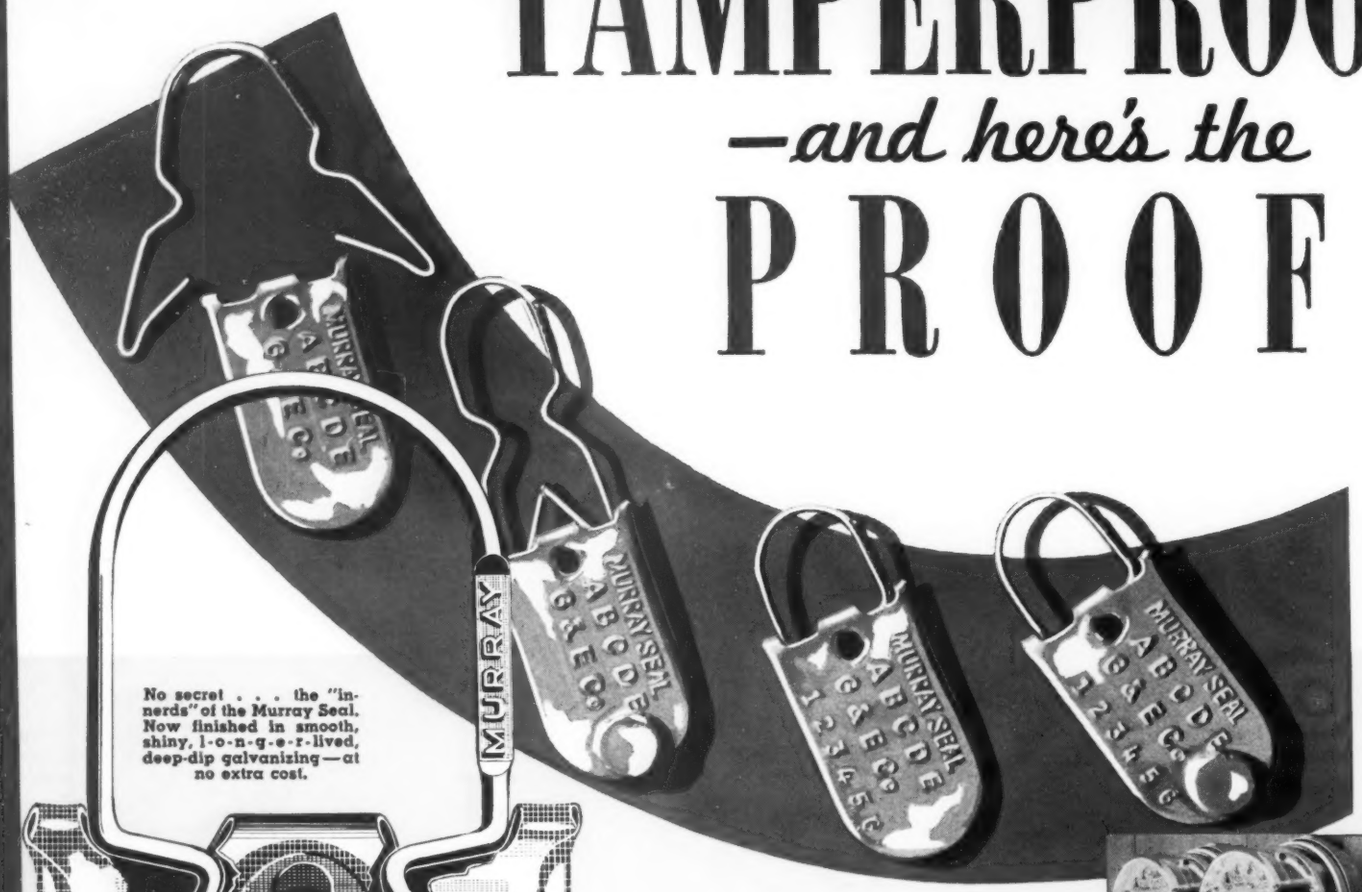
OCTOBER 7, 1939



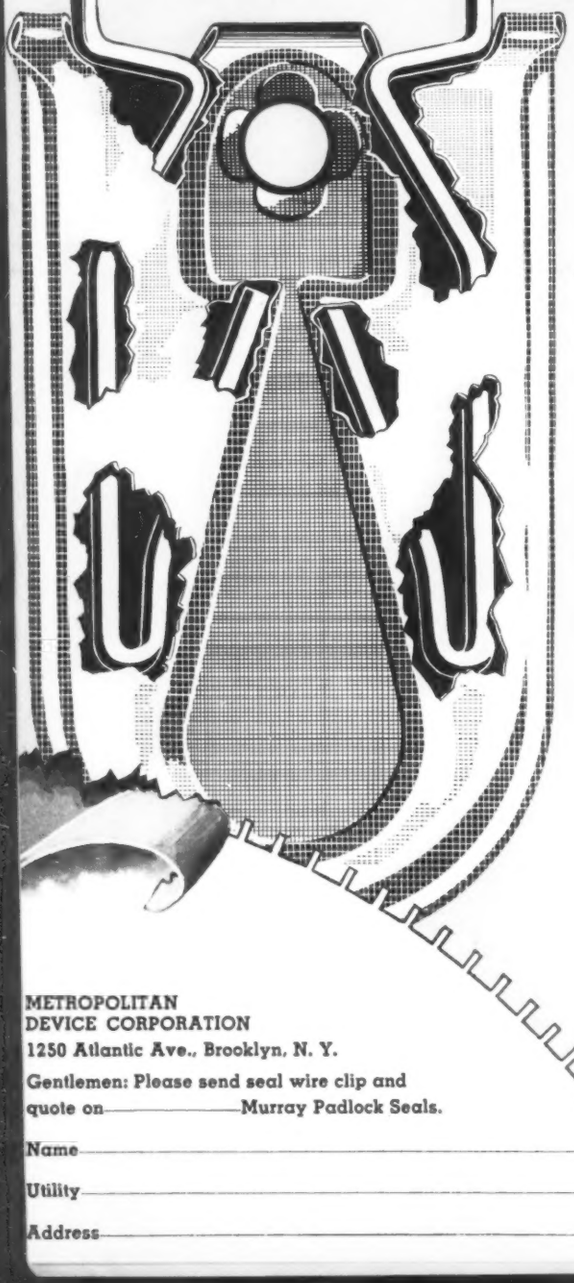
LIMITERS PREVENT SPREAD OF NETWORK FAULTS

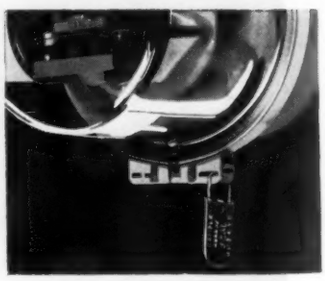
TAMPERPROOF!

—and here's the PROOF



No secret . . . the "innerds" of the Murray Seal. Now finished in smooth, shiny, l-o-n-g-e-r-lived, deep-dip galvanizing—at no extra cost.





Self-locking—but NON-opening! In the cut-away drawing you can see how the special-alloy wire-ends snap under two shoulders, and how the wire lies along the top of the seal, *sealing itself against tampering*. The wire cannot be pulled out. This seal must be broken to be removed. Telltale evidence—either its absence or destruction—is certain. Standard with leading utilities because it's today's best known discourager of current theft.

Left—The new nobby Murray Clip, for holding Murray Seal Wires. Meter men find the kits in neater shape and their work eased... Below — Fill clip. Send coupon for free clip

METROPOLITAN
DEVICE CORPORATION
1250 Atlantic Ave., Brooklyn, N. Y.

Gentlemen: Please send seal wire clip and quote on_____Murray Padlock Seals.

Name_____

Utility_____

Address_____

Normal Business

For a month now business has been going forward, unemployment dropping, prices rising—and for a month there has been war in Europe. Ergo, we are in a war boom. But it isn't so, yet. War may have played some part. It may have been the stimulator. So far, however, we have been engaged in peace time business, fostered somewhat by fear of rising prices but generally normal in character.

For the electrical business there is no better gage than the curve of weekly kilowatt-hour output. Ever since May this curve has followed the pattern of 1936 during that period when business was staging a come-back to pre-depression levels. The upward slope is perhaps a little steeper now, but that, while emphasized by an inrush of business at this time, is caused in large measure by the cumulative effect of load that has been constantly added during the past twelve months.

In other words, the present trend of the output curve is not an abnormal situation. It is the logical outcome of a continued load-building campaign. Without any improvement in industrial output, the load curve this year would have shown an improvement over previous years. Better industrial business merely accentuated the situation.

For a true picture one must go back and analyze the sales of energy to customer classes for several years. Since 1929 residential sales have doubled. They were 9½ billion in 1929 and 19 billion in 1938. Commercial sales in the same period increased about 5½ billion, or over 40 per cent. Industrial sales, on the other hand, were up about a billion or between 2 and 3 per cent. However, industrial sales had gone much higher in 1937.

This constant and steady hammering at small loads has brought an aggregate of business that has overshadowed the slump in industrial load. Therefore, any return of industrial load to a figure which might be called normal would make the curve look like boom times.

Obviously, such a trend calls attention to the question of adequate facilities to meet a continued use. A careful study of the curve will show that the present trend had its roots laid a year ago. Since that time the utilities have been the most active of any period probably in the past ten years in adding to capacity and strengthening distribution.

The news pages of Electrical World, for instance, reveal over a million kilowatts of new capacity scheduled for completion this year and nearly a million and a half kilowatts for completion in the next two years. Moreover, nearly every utility of any size is studying ways and means of strengthening its system.

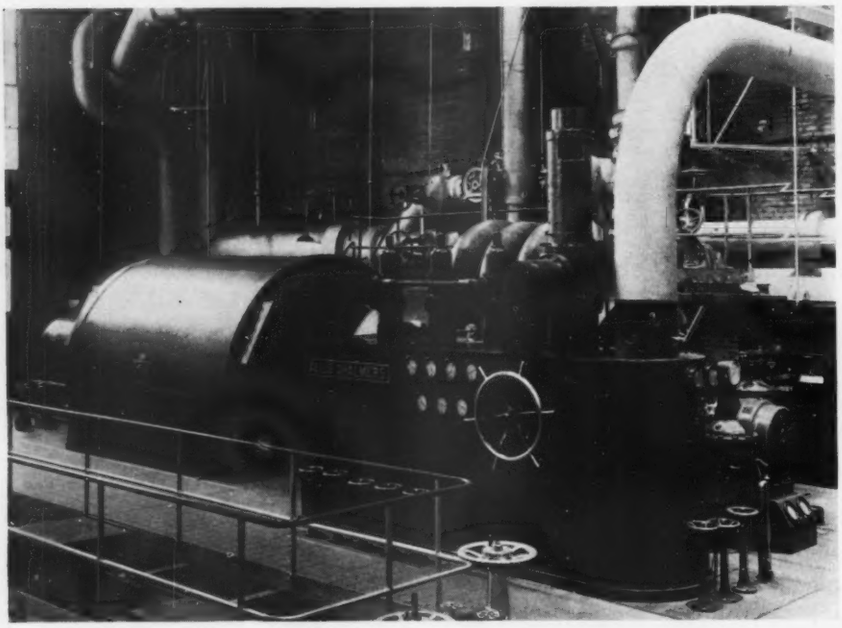
The construction expenditures for this year have been on a par with those for the two previous years. Such expenditures, while adequate to take care of previous growth, will be insufficient to take care of any greatly extended growth at the present time. Under such conditions, it would be reasonable to expect a budget for next year at least a third to a half greater.

So, come war or peace, conditions in the electrical industry continue to look bright for several months ahead.

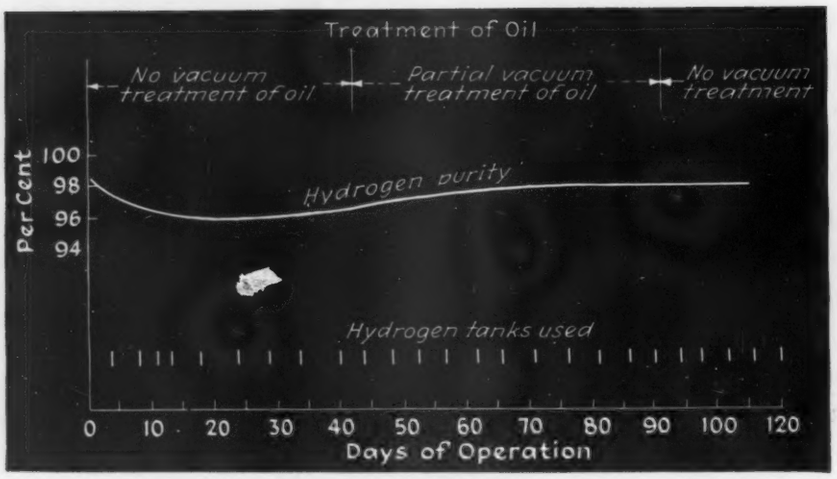
PROGRESS IN HYDROGEN

S. H. MORTENSEN and S. BECKWITH, *Allis-Chalmers Manufacturing Company, Milwaukee, Wis.*

COMMERCIAL hydrogen cooling of turbo-generators is so new that only three or four units have been in operation more than one year. This practice has theoretical advantages that have been frequently outlined, but a discussion of operating experience and of the detailed improvements in auxiliary equipment should be of use to the industry. Allis-Chalmers has one 18,750-kva., 3,600-r.p.m., hydrogen-cooled unit which has been in operation for five months and another 31,250-kva., 3,600-r.p.m. unit that is now being installed. This discussion will deal with the design details of the hydrogen cooling.



An 18,750-kva. hydrogen-cooled turbo-generator



Record of operation of 18,750-kva. hydrogen-cooled unit

An oil film seal of a new type has been developed to prevent leakage of hydrogen at the point where the generator shaft passes through the gas-tight housing of the machine. A diagrammatic view of this seal is shown in an accompanying illustration.

Oil Piping Arrangement

Oil is circulated around the flange to provide adequate cooling, but only a very small quantity of oil escapes past the sealing face and into the hydrogen. This small quantity of oil then passes through a sight-flow glass and into a detraining or deforming tank, where it remains long enough to give up all of its large hydrogen bubbles. It then returns thru a U-tube inside the tank and to the bearing drain. Such a small quantity of oil passes through the hydrogen that the amount of hydrogen carried out by it is quite negligible.

Two independent oil supplies are provided which feed through check valves, so that in case one oil supply fails the other one automatically comes into action. Diaphragm valves are used to reduce the pressure to the desired value. On the first two orders vacuum-treating equipment was supplied for the oil, but has not been used except for experimental purposes.

Hydrogen Piping and Control

All equipment for hydrogen control piping and control, except the remote operating floor panel, is mounted directly below the generator, and all of the smaller items, including most valves and piping,

COOLING OF GENERATORS

Three or four turbo-generators with hydrogen cooling have now been operating more than one year — Great improvements have been made in details of auxiliary equipment — Operating experience encouraging

most instruments and gages, and the starting control for the vacuum and oil pumps are mounted in a cabinet. An electrically connected remote operating panel is provided. This remote panel shows the hydrogen purity and hydrogen pressure and has a duplicate set of alarm lights indicating abnormal operation of hydrogen or oil control parts.

On the first machines provisions were made for using carbon-dioxide to avoid explosive mixtures when admitting or exhausting the generator hydrogen. However, scavenging with carbon-dioxide or other inert gas has been found unnecessary as the type of shaft seal used permits evacuation of generator to a pressure of one-fifth of an atmosphere or less where mixtures of hydrogen and air are non-explosive. This means of avoiding explosive mixtures has several advantages, which may be listed as follows:

1. No carbon-dioxide or other inert gas is required for scavenging generator.

2. Since interchange of hydrogen and air takes place at one-fifth of an atmosphere, only about one-fifth as much excess hydrogen above one volume is required.

3. Extra pipes to drain all "pockets" of carbon-dioxide are not essential.

4. Less time is required to empty or fill generator with hydrogen.

5. The filling operation is simplified.

6. Compressed air or blowers are not needed to remove carbon-dioxide after exhausting hydrogen.

Operation of Control Equipment

Operation of the control equipment during normal operation may be described as follows:

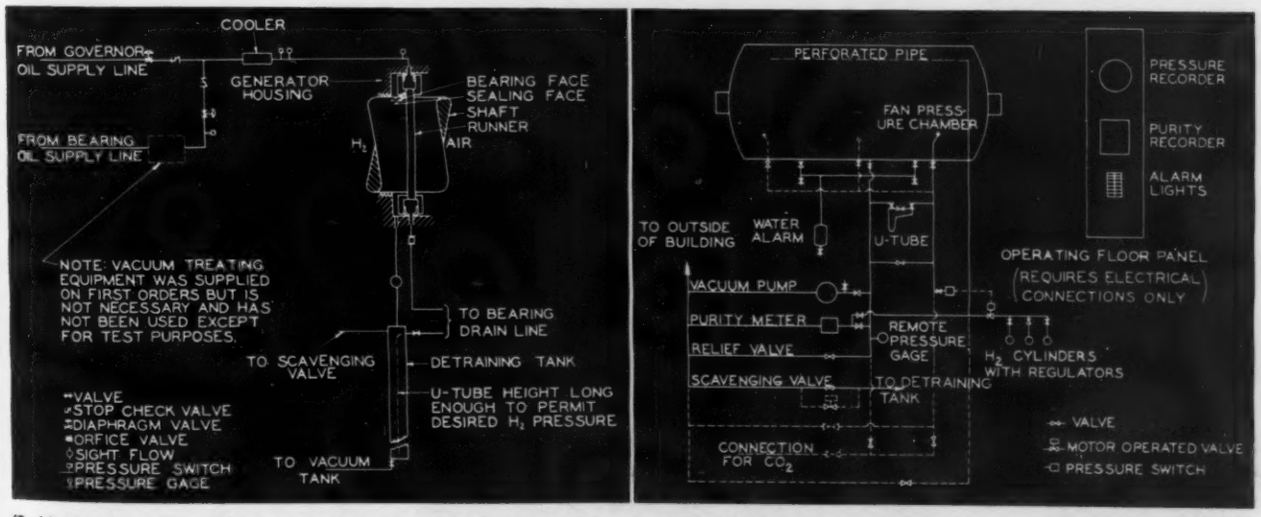
Pressure of hydrogen in the generator housing is maintained at any desired level (normally ¼ lb. per sq.in.) by a pressure switch which operates a motor-operated valve to admit hydrogen from the hydrogen containers. These containers are set to empty in sequence by setting the pressure regulators on each one at slightly different values. A relief valve is provided to prevent excessive hydrogen pressure. Hydrogen purity is shown by a thermal conductivity type remote-operated instrument. This meter is supplemented by a purity scale on an inclined vertical U-tube which reads pressure drop across the fans on the rotor of the generator. Since the pressure is proportional to the density, the purity may be read from a separate scale on the same instrument.

Purity of the hydrogen normally remains high without any attention, as it is fixed at a high value by the favorable balance between the impurities brought in with oil from the shaft seal and the pure hydrogen admitted to replace leakage. This leakage includes the hydrogen which leaks through the housing, the hydrogen carried out by the shaft seal oil, and the hydrogen needed to operate the thermal purity cell.

Indication of any water or oil leaking into the machine is given by a water alarm located below the machine and connected to catch any liquid in the bottom of the machine. Mercoid type pressure switches are used to operate alarms for high or low oil pressure, emergency oil line operation and vacuum failure. Alarms for high and low hydrogen pressure, high and low oil level, high and low hydrogen purity, and for grounds in the alarm system and wiring are also provided.

Operating Experience

As mentioned above, one machine has been operating with hydrogen continuously since it was placed in

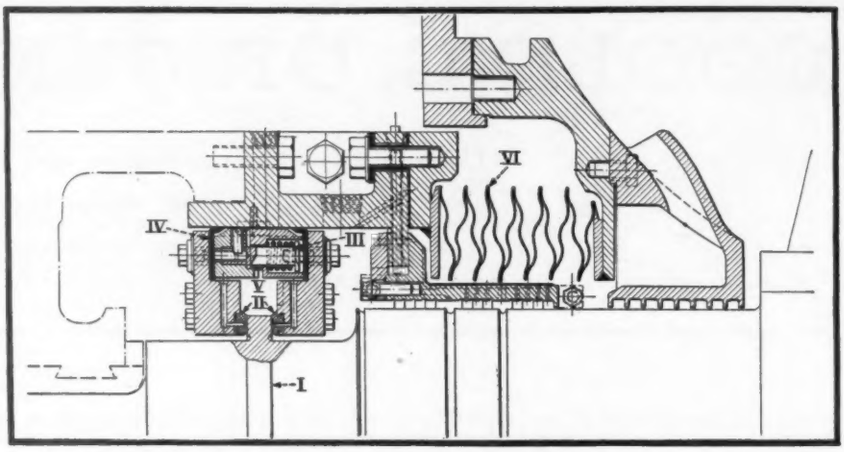


(Left) Oil piping arrangement for shaft seal of hydrogen-cooled unit. (Right) Hydrogen piping. Dotted lines show extra piping for CO_2 scavenging not used, because vacuum scavenging was more satisfactory. Motor-operated valve for automatically maintaining purity is also shown dotted because purity remains high without scavenging.

service in January. Each cylinder of hydrogen contains 220 cu. ft. and has lasted an average of more than 4½ days. As the three cylinders empty themselves in sequence the only operating attention needed to maintain a hydrogen supply is a replacement of empty cylinders once a week. It will be noticed from the accompanying purity record that the purity changes quite slowly. The initial drop in purity is caused by air incidental to the higher oil flow during the initial operation, and the subsequent rise in purity is caused chiefly by a decreased oil flow reducing air entering the hydrogen side of the machine and also partly by the experimental period during which entrance air was eliminated by vacuum treatment of seal oil.

No Shutdown Difficulties

No changes have been required in any of the auxiliary equipment or the oiling system equipment or pressures when changing from normal operation to turning gear operation or to complete shut-down. It is possible, however, to shut down any of the auxiliary equipment during shut-down as long as one pump is kept in operation. Short shut-downs of all oil pumps during standstill will not cause dangerous loss of hydrogen as the oil film maintained at the very small clearance under the sealing face will act as a seal.

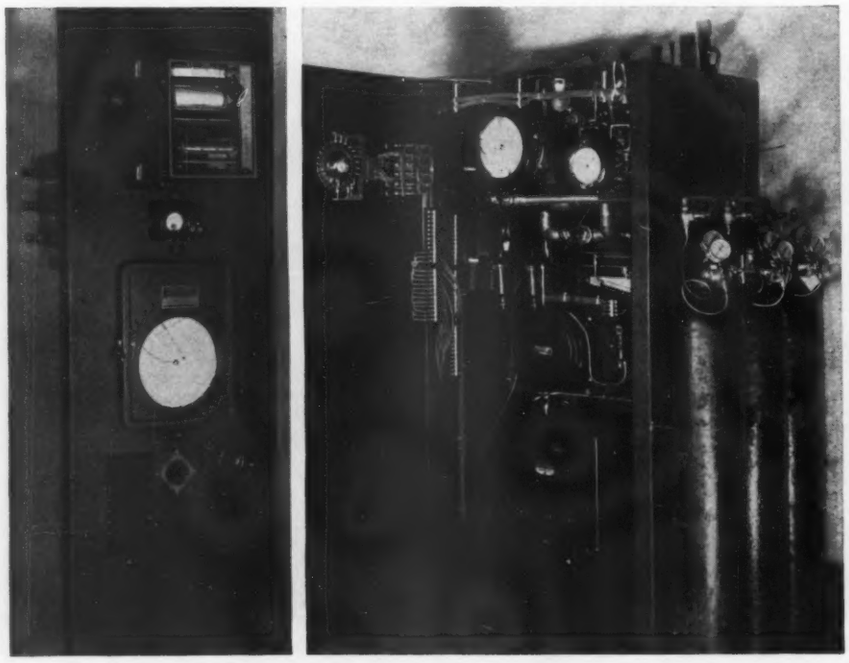


Oil seal to prevent hydrogen leakage along turbine shaft

A small runner (I) is provided on each end of the generator shaft close to the main bearing, and against each face of the runners a conventional babbitt thrust bearing (II) is held by calibrated springs (III), permanently set to give a predetermined bearing pressure.

As may be seen the babbitted thrust bearing surface is divided into outer and inner surfaces by means of an annular oil groove connected to oil pressure chamber (V). The outer surface is subdivided by radial oil grooves where the inner surface forms a continuous ring separated from the runner by an oil film which forms an air- and gas-tight seal. Under operation the major part of the lubricating oil from pressure chamber (V) cools thrust bearing by circulation through the grooves in the outer bearing surface and only a very small amount of oil passes over the inner bearing surface into the hydrogen side of the bearing. The oil pressure in (V) is adjusted to counterbalance the springs and hydrogen pressures acting on thrust bearing. Cup leather (IV) between the stationary thrust bearing rings and seal housing provides oil- and gas-tight joints and gives thrust bearing lateral flexibility and self-alignment. The gas-tight joint (VI) furnishes a flexible connection between the seal mounting on bearing pedestal and on the stator yoke.

Scavenging of the machine by means of the vacuum pump has been very satisfactory. The time required for the complete filling with hydrogen or the complete removal of hydrogen has never been more than two hours, and has been done in as short a time as 45 minutes. A two-speed motor is provided on the vacuum pump to facilitate this scavenging operation. The gas removed from the generator at any time for scavenging, for operating the purity cell, or for any other purpose, is carried to the outside of the building. Operating experience indicates that sufficient moisture is brought into the machine with the sealing oil, new hydrogen, etc., to warrant for the hydrogen a suitable dryer.



Left—Operating panel provides remote control of hydrogen cooling. Right—Interior view of hydrogen control cabinet for 31,250-kva. unit

No Vibration

The general design of an Allis-Chalmers Manufacturing Company's hydrogen-filled generator consists of heavy ribbed yoke construction combined with the dome-shaped end covers, which minimizes yoke vibrations and renders the machine safe from explosions. The arrangement of the hydrogen coolers makes tube cleaning as well as installation or removal of the cooling elements a simple matter.

Distribution Planning—I
Calculating Overhead Primaries

A quick method for determining voltage drops and a record of conductor and transformer sizes are furnished by a primary calculation sheet, simple to use and easily revised when changes are made

C. E. ARVIDSON, *Commonwealth & Southern Corporation, Jackson, Mich.*

IN ORDER to keep pace with constantly changing load conditions and to determine the changes necessary to maintain satisfactory voltage conditions on the primary system, voltage calculations should be made from time to time. Calculations for determining primary voltage conditions may become rather complex and difficult when made in accordance with the usual methods and may require an excessive amount of time. To remedy this situation a simple method has been devised for making these calculations and recording them in such form as to be easily interpreted for design purposes.

Simplified Method—Unit Voltage Drops

The simplified method of making voltage calculations is based upon a unit voltage drop per 10,000 kva.-ft. This unit represents the voltage drop caused by a 10-kva. load at the end of a circuit, 1,000 ft. long, or a 100-kva. load at the end of a 100-ft. circuit, etc. The unit voltage drops for most common primary voltages and conductor sizes, both single and three phase, are shown in Table I.

Obviously these unit drop values are compromise values to the extent that they represent the voltage drop for an assumed average power factor and average conductor spacing. The use of such average values is practicable and reasonable for two reasons:

1. Although primary conductor spacings found in actual practice do vary over a small range, this variation has a minor effect upon voltage drop.

2. For conductor sizes up to about No. 1/0 copper variation in load power factor between 75 per cent and 90 per cent has comparatively little effect upon the voltage drop.

The use of these average values, therefore, will produce results which are sufficiently accurate and which certainly are as precise as is the knowledge of the load conditions which exist on the circuit.

Primary Load Values

The determination of actual loads to be expected on a primary distribution circuit is difficult, since load conditions are variable. Installed transformer capacities should, however, be fairly proportional to the loads on their secondary circuits. It is reasonable, then, to use the installed transformer capacities as a basis for making primary voltage drop calculations. The results of these calculations can be adjusted by multiplying the "basic" voltage drops thus obtained by a capacity factor, which is the ratio of the actual maximum load on the circuit to the total kva. of transformer capacity installed on the circuit. Thus voltage calculations once made for a particular circuit are useful until circuit conditions are changed by new construction.

Before any calculations can be made it is necessary to have definite information regarding the circuit in question. It is important to have and to keep up to date primary maps (to scale) of every distribution circuit showing transformer locations, transformer sizes, locations of taps or branches, and the number and sizes of conductors. These maps should

Table I—Unit Voltage Drop
(Based on 10 Kva. per 1,000 Ft.)

Note—For wye-operated, three-phase, four-wire systems the unit drops below are from line to neutral and should be multiplied by $\sqrt{3}$ when line to voltage drops are desired.

Nominal System Voltage		2300	2400	4000Y	4160Y	4600	4800	6900	7200	8320Y
Lamp Voltage Base		115	120	115	120	115	120	115	120	120
#6 Copper #4 Al.	1φ	3.80	3.64	3.80	3.64	1.90	1.83	1.26	1.20	1.83
#4 " #2 "	"	2.44	2.32	2.44	2.32	1.22	1.16	0.82	0.79	1.16
#3 " #1 "	"	2.04	1.95	2.04	1.95	1.02	0.97	0.68	0.65	0.97
#2 " #1/0 "	"	1.76	1.66	1.76	1.66	0.88	0.83	0.59	0.56	0.83
#1/0 " #3/0 "	"	1.30	1.24	1.30	1.24	0.68	0.63	0.45	0.43	0.62
#6 Copper #4 Al.	3φ	1.89	1.82	0.63	0.61	0.95	0.91	0.63	0.60	0.30
#4 " #2 "	"	1.22	1.16	0.41	0.39	0.61	0.58	0.41	0.39	0.20
#3 " #1 "	"	1.02	0.97	0.34	0.32	0.51	0.48	0.34	0.32	0.16
#2 " #1/0 "	"	0.88	0.83	0.29	0.28	0.44	0.42	0.29	0.28	0.14
#1 " #2/0 "	"	0.76	0.73	0.25	0.24	0.38	0.37	0.25	0.24	0.12
#1/0 " #3/0 "	"	0.65	0.62	0.22	0.21	0.32	0.31	0.22	0.21	0.10
#2/0 " #4/0 "	"	0.57	0.55	0.19	0.18	0.29	0.28	0.19	0.18	0.09
#3/0 "	"	0.44	0.43	0.15	0.14	0.22	0.21	0.15	0.14	0.07

Overhead Distribution System
Primary Circuit Layout

Sheet 3

Date 9-23-38

Sample
Company

Made by McKinley

Division Sample Circuit Sample

Nominal Circuit Voltage 4000 Substation Sample

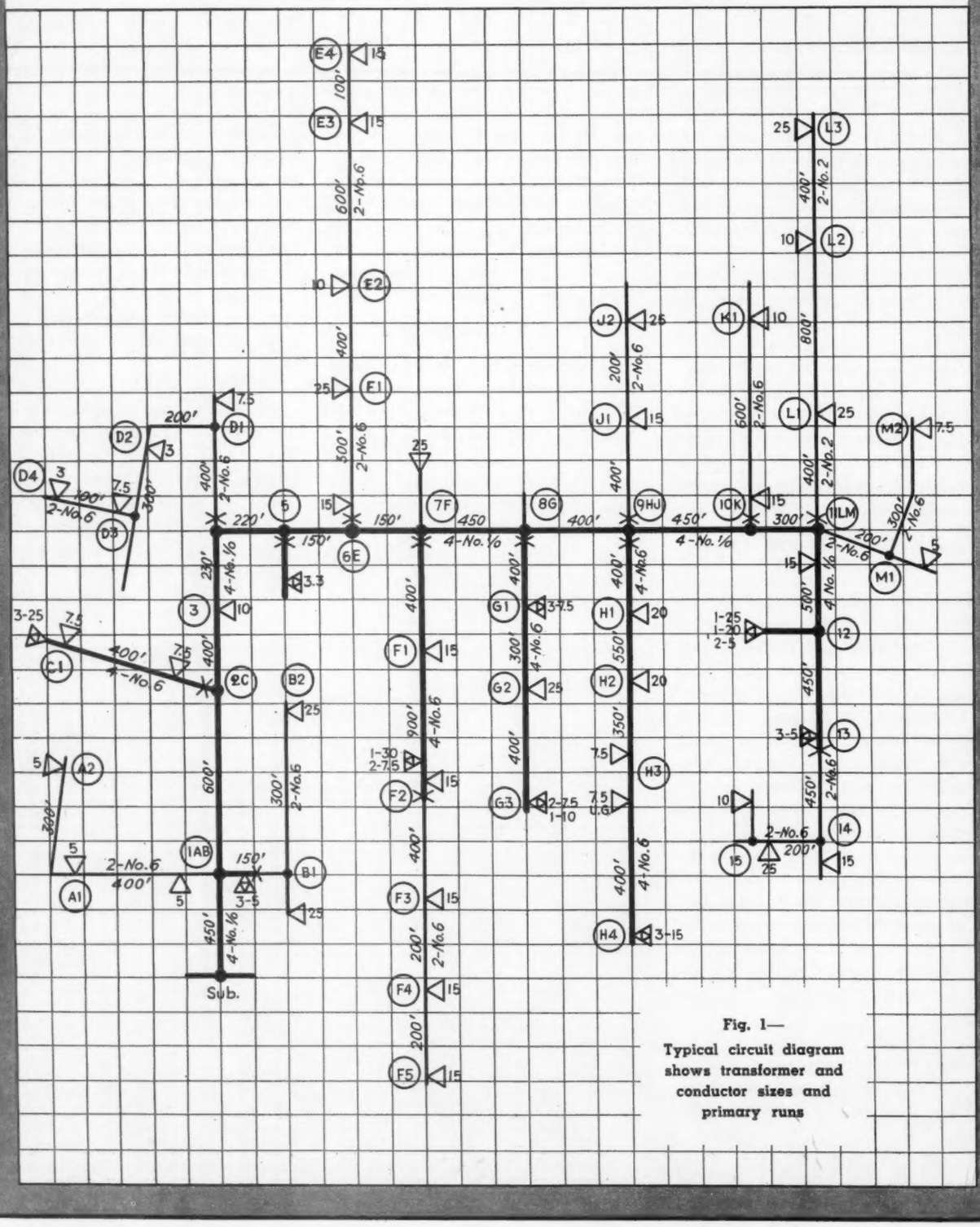


Fig. 1—
Typical circuit diagram shows transformer and conductor sizes and primary runs

Table II

Overhead Distribution System Primary Circuit Data and Calculations

Sample

Company

Division.....Sample — Circuit.....Sample

Nominal Circuit Voltage.....4,000 — Substation.....Sample

1. Total Transformer Kva..... 947
2. Maximum Circuit Load Kva.... 805
3. Circuit Capacity Factor..... 0.85
4. Basic Drop Substation to Last Transformer... 65.7
5. Basic Drop Substation to First Transformer... 9.4
6. Basic Drop First to Last Transformer..... 56.3
7. Calculated Voltage Drop First to Last Transformer (6) x (3)..... 48
8. Per Cent Voltage Drop First to Last Transformer (7) ÷ Circuit Voltage..... 2.1%

(Voltage Drops are Line to Neutral for Y Circuits)

	Distance, Ft.			Transformer, Kva.			Basic Voltage Drop		
Station No.	Between Stations	From Sub-station	Conductor Size	At Station	Subtotal From Last Station	*Kva. Ft.* 10,000 ($B \times F$) 10,000	Unit Voltage Drop	From Previous Station ($G \times H$)	From Substation (Sub-Total) (Col. 1)
A	B	C	D	E	F	G	H	I	J
0	0	0	.....	0	0	0	....	0	0
1AB	450	450	4—No. 1/0	80	947	42.6	0.22	9.4	9.4
2C	600	1,050	4—No. 1/0	90	867	52.0	0.22	11.4	20.8
3	400	1,450	4—No. 1/0	10	777	31.0	0.22	6.8	27.6
4D	230	1,680	4—No. 1/0	21	767	17.6	0.22	3.9	31.5
5	220	1,900	4—No. 1/0	9	746	16.4	0.22	3.6	35.1
6E	150	2,050	4—No. 1/0	80	737	11.1	0.22	2.4	37.5
7F	150	2,200	4—No. 1/0	145	657	9.9	0.22	2.2	39.7
8G	450	2,650	4—No. 1/0	73	512	23.0	0.22	5.1	44.8
9HJ	400	3,050	4—No. 1/0	207	439	17.6	0.22	3.9	48.7
10K	450	3,500	4—No. 1/0	25	232	10.4	0.22	2.3	51.0
11M	300	3,800	4—No. 1/0	87	207	6.2	0.22	1.4	52.4
12	500	4,300	4—No. 1/0	55	120	6.0	0.22	1.3	53.7
13	450	4,750	4—No. 1/0	15	65	2.9	0.22	0.6	54.3
14	450	5,200	2—No. 6	15	50	2.3	3.80	8.7	63.0
15	200	5,400	2—No. 6	35	35	0.7	3.80	2.7	65.7
1AB	...	450	.....	5	15	....	....	....	9.4
A1	400	850	2—No. 6	5	10	0.4	3.80	1.5	10.9
A2	300	1,150	2—No. 6	5	5	0.2	3.80	0.8	11.7
1AB	...	450	.....	15	65	....	....	....	9.4
B1	150	600	2—No. 6	25	50	0.8	3.80	3.0	12.4
B2	300	900	2—No. 6	25	25	0.8	3.80	3.0	15.4
2C	...	1,050	.....	8	90	....	....	....	20.8
C1	400	1,450	4—No. 6	82	82	3.2	0.63	2.0	22.8
4D	...	1,680	.....	..	21	....	....	....	31.5
D1	400	2,080	2—No. 6	8	21	0.8	3.80	3.0	34.5
D2	200	2,280	2—No. 6	3	13	0.3	3.80	1.1	35.6
D3	300	2,580	2—No. 6	7	10	0.3	3.80	1.1	36.7
D4	100	2,680	2—No. 6	3	3	....	3.80	....	....
6E	...	2,050	.....	15	80	....	....	....	37.5
E1	300	2,350	2—No. 6	25	65	2.0	3.80	7.6	45.1
E2	400	2,750	2—No. 6	10	40	1.6	3.80	6.1	51.2
E3	600	3,350	2—No. 6	15	30	1.8	3.80	6.8	58.0
E4	100	3,450	2—No. 6	15	15	0.2	3.80	0.8	58.8

also indicate to what phases the transformers are connected so that a balance of load among the phases can be approximated.

A form has been prepared for use in making sketches of the circuit for calculation purposes. These sketches should indicate all of the information mentioned above under "Circuit Data." A sample circuit layout is shown on the opposite page.

Reference station numbers should be assigned to (1) each transformer (or group of transformers), (2) each junction point, and (3) each change of wire size along the feeder or main portion of the circuit. An alphabetical suffix should be assigned to each branch junction point and this letter should be used as a prefix in designating all stations on the connecting branch. Transformers on very short branches should be considered as being located at the junction point. The distances between stations should be indicated.

A form has been prepared for tabulating circuit data and for making voltage calculations of which a sample is shown in Table II as applied to part of the layout opposite. The first four columns (columns A to D inclusive) are self-explanatory, containing information copied from the circuit sketch. Column E should indicate the total kva. capacity of all transformers at or near each station and/or the total kva. of all transformers on a branch. Column F is the sub-total of the transformer capacity starting at the last station. The amount in this column opposite a station number represents the total basic load carried by the circuit between that station and the preceding station.

The next step in these calculations consists of filling out column G, which is obtained by multiplying column F by column B and dividing by 10,000, since the unit voltage drop is on the basis of 10,000 kva.-ft. Column H shows the unit voltage drops for the conductor sizes indicated and should be obtained from Table I. Column I is then derived by multiplying column G by column H and is equal to the "basic voltage drop" between stations. These basic voltage drops between stations are then subtotaled in column J so as to give a total at each station which will be the basic voltage drop from the substation to each station. The actual voltage drop to any point can then be determined by multiplying these basic voltage drops by the circuit capacity factor which is equal to the actual maximum circuit load divided by the total transformer capacity.

Value of Calculation Sheet

The particular merit of this calculation sheet is that it not only furnishes a record of transformer sizes, locations and conductor sizes, but it also indicates the basic voltage drops between all stations on the circuit from which the actual voltage drops can be obtained at any time merely by multiplying these basic voltage drops by the circuit capacity factor then existing. No further circuit calculations need be made until physical changes in the circuit are contemplated. Furthermore, once this record is completed, the effect of any proposed change can be quickly approximated.

• "Residential Loads and Diversities" is the subject of the next (second) article in a series of six on the technique of distribution design and analysis and will appear in "Electrical World," October 21. Reprints of the six articles collected in a stiff cover binding will be available when the series is completed. Edition will be limited and orders should be sent in early.

Limiters Prevent Cable Faults From Spreading on Networks

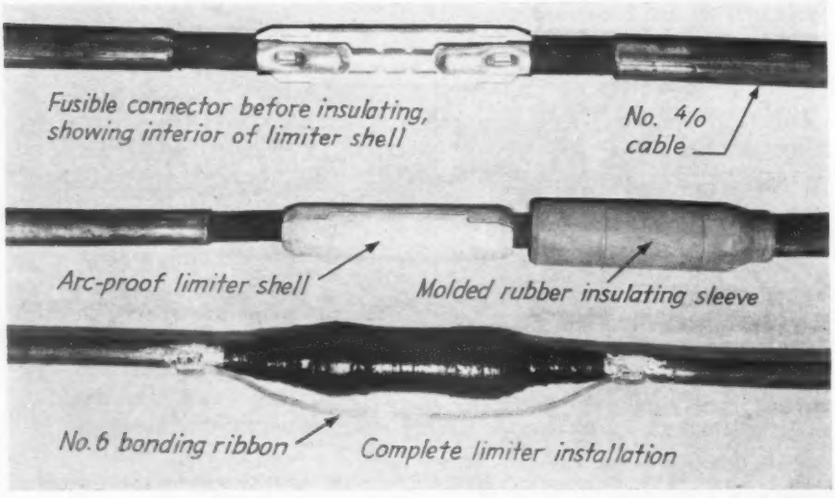
Three years' operating experience with limiters on old and new low-voltage distribution networks proves adequacy of short-circuit protection provided — Installation methods discussed

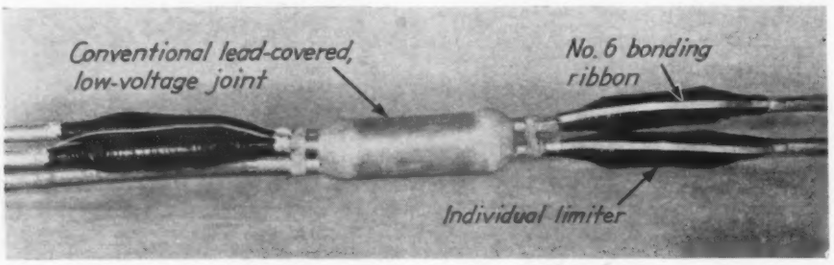
C. P. XENIS *and* **E. WILLIAMS**, *Consolidated Edison Company of New York, Inc.*

OPERATING experience on 170,000 limiters installed during the last three years on the low-voltage distribution networks of the Consolidated Edison system has indicated that faults on cables thus protected were confined to the section of origin.

Defined briefly, the limiter is a device with a reduced metallic cross-section and suitable terminal facilities to permit its installation on secondary cables at multiple points on the network system. It has a time-current characteristic of such a nature that it will "fuse" and thus interrupt short-circuit currents in time to protect the cables on either side of a fault from becoming damaged through overheating. Thus the spreading of the disturbance is "limited" and the creation of additional faults is prevented.

The limiter differs from a conventional fuse in that it is designed to be selective with respect to the cable insulation damage characteristic and therefore carries no specific ampere rating. Its design and method of assembly dispense with the junction boxes and supporting assemblies usually found on fuse-protected networks.


Fusible connector before insulating, showing interior of limiter shell
No. 4/0 cable
Arc-proof limiter shell
Molded rubber insulating sleeve
No. 6 bonding ribbon
Complete limiter installation



On existing networks the individual limiter is used in this manner. It is applied not only to lead-covered, rubber-insulated cables, as shown here, but also to paper-insulated, lead-covered cables and non-leaded cables.

It is designed to be part of a wire connector, terminal lug, crab joint or other wire or cable connecting or terminating device. In each case the limiter is inclosed in a compact, arc-confining chamber so that it may interrupt a faulted circuit without exploding or in any way burning the outside insulating covering of the assembly. The development of the limiter and a discussion of its operating characteristics and selective performance with respect to other parts of the network have been presented in a previous publication by one of the authors.*

In developing the various devices, tools and construction methods it has been our aim to make available a limiter installation procedure at the lowest possible investment and operating cost. Readily replaceable fusible elements have been considered, but are not justifiable from an economic point of view. Similarly, indicating features to reveal blown limiters are unnecessary, since a practicable and simple operating procedure is available for the detection and replacement of blown units.

Installed on Existing Networks

It has been our experience that some of the most severe and destructive secondary faults are created while street excavations are being made for the installation of various underground facilities in the vicinity of secondary network cables. Furthermore, during the construction period the cables are in temporary inclosures, which, by their nature, cannot protect them from external dam-

*"Short-Circuit Protection of Distribution Networks by the Use of Limiters," by C. P. Xenis, Consolidated Edison Company of New York, Inc., published in *Electrical Engineering*, September, 1937.

age as adequately as their permanent structures.

Under these conditions the tools used for breaking pavement, excavating and other construction work are sometimes driven into the cables, causing severe short circuits. The damage thus caused creates the type of fault that frequently is not self-clearing. The resulting short-circuit currents are supplied for such long periods of time that the copper conductors overheat sufficiently to produce severe damage to the cable insulation. In some cases the cables supplying the short-circuit current are overloaded so seriously that additional faults are established elsewhere, and thus the intensity and extent of the disturbance are increased. It is in the clearing of such faults that the limiters find one of their best applications.

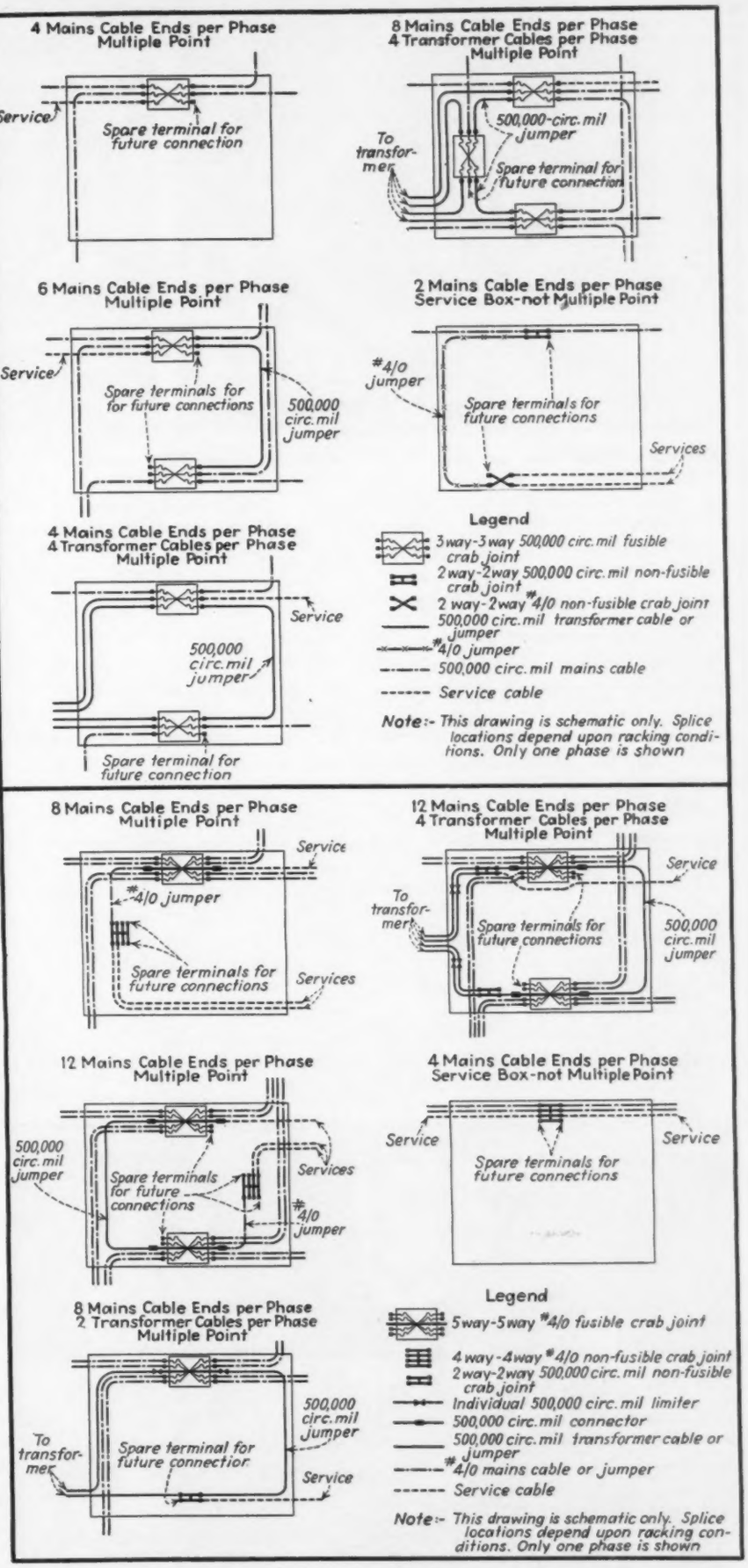
Since secondary faults from other causes also may be of a sustained nature, it is desirable to provide limiter protection in certain existing network areas where there is great congestion of underground cables or where loss of supply might have serious results.

Used on Network Extensions

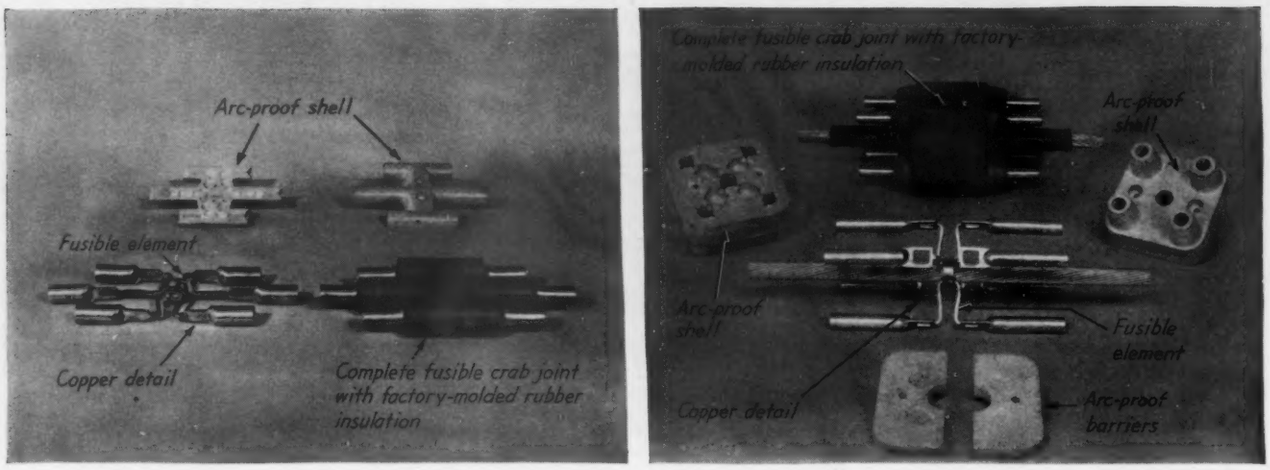
Limiters have also been found advantageous in the d.c. network system, which is made up of a number of areas supplied from separate substations and interconnected by the network mains cables crossing so-called substation boundary lines. In cases of loss of supply to a considerable network area, as may occur through the shut-down of a d.c. substation, the resulting transfer of load from adjacent substation areas makes it desirable to prevent the dangerous overloading of the mains cables crossing the substation boundary lines. This has been accomplished by inserting a limiter in each of these mains cables.

The Consolidated Edison Company has installed 115,000 limiters on existing networks (as well as 55,000 on *new* networks) during the last three years. Of these, 30,000 were installed on *paper*-insulated and 85,000 on *rubber*-insulated cables. Of the 30,000, approximately 2,500 were used in connection with the overload protection of d.c. network cables which cross d.c. substation boundary lines.

In extending the secondary network the Consolidated Edison Com-


4 Mains Cable Ends per Phase Multiple Point
Service
Spare terminal for future connection
8 Mains Cable Ends per Phase 4 Transformer Cables per Phase Multiple Point
To transformer
500,000-circ. mil jumper
Spare terminal for future connection
6 Mains Cable Ends per Phase Multiple Point
Service
Spare terminals for for future connections
500,000 circ. mil jumper
2 Mains Cable Ends per Phase Service Box-not Multiple Point
#4/0 jumper
Spare terminals for future connections
Services
4 Mains Cable Ends per Phase 4 Transformer Cables per Phase Multiple Point
Service
500,000 circ. mil jumper
Spare terminal for future connection
Legend
3 way-3 way 500,000 circ. mil fusible crab joint
2 way-2 way 500,000 circ. mil non-fusible crab joint
2 way-2 way #4/0 non-fusible crab joint
500,000 circ. mil transformer cable or jumper
#4/0 jumper
500,000 circ. mil mains cable
Service cable
Note:- This drawing is schematic only. Splice locations depend upon racking conditions. Only one phase is shown
8 Mains Cable Ends per Phase Multiple Point
Service
#4/0 jumper
Spare terminals for future connections
Services
12 Mains Cable Ends per Phase 4 Transformer Cables per Phase Multiple Point
Service
To transformer
Spare terminals for future connections
500,000 circ. mil jumper
12 Mains Cable Ends per Phase Multiple Point
500,000 circ. mil jumper
Spare terminals for future connections
Services
#4/0 jumper
4 Mains Cable Ends per Phase Service Box-not Multiple Point
Service
Service
Spare terminals for future connections
8 Mains Cable Ends per Phase 2 Transformer Cables per Phase Multiple Point
To transformer
Spare terminal for future connection
500,000 circ. mil jumper
Service
Legend
5 way-5 way #4/0 fusible crab joint
4 way-4 way #4/0 non-fusible crab joint
2 way-2 way 500,000 circ. mil non-fusible crab joint
Individual 500,000 circ. mil limiter
500,000 circ. mil connector
500,000 circ. mil transformer cable or jumper
#4/0 mains cable or jumper
Service cable
Note:- This drawing is schematic only. Splice locations depend upon racking conditions. Only one phase is shown

Various points on the networks call for different splicing arrangements. The splicing arrangements for the 500,000-circ.mil system (one cable per phase) are shown schematically above and those for the twin No. 4/0 system (two cables per phase) below



Preinsulated crab joints are used at "multiple points" on secondary networks
The twin No. 4/0 system recently has been standardized for all new network extensions to the Consolidated Edison system. On such extensions two cables are installed per phase and this type of fusible crab joint (at right) is used for splicing each phase. Note that center branch consists of a 500,000-circ.mil stranded conductor; it is used to make connections to either a ring bus or 500,000-circ.mil transformer cable. Fusible crab joint for 500,000-circ.mil system shown at left.

pany has adopted the practice of providing complete limiter protection on all new additions to the secondary mains cable system. In splicing new cables of a network extension it is desirable to incorporate limiter elements directly into the joints so that limiter protection can be provided at little or no increase in cost over the conventional practice of joining such cables.

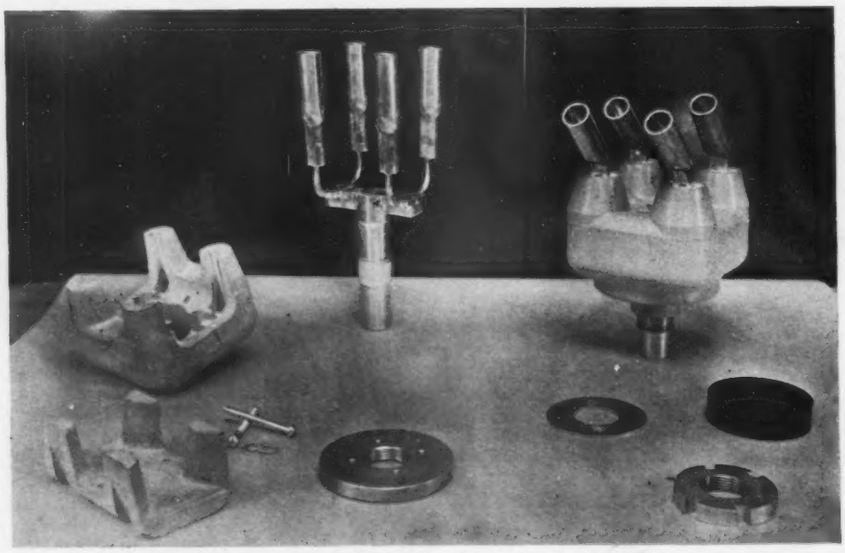
Five years' experience with non-leaded crab joints has shown that elimination of crotch taping, accomplished by the use of crab joints, is an important advantage. Further, the tubular type terminals provide a reliable and inexpensive method of making compression-type cable connections. This latter feature, which eliminates solder, is essential, since crab joints designed to include limiters or fusible sections require cable connections able to withstand an appreciable temperature rise under fault conditions.

As in the case of the individual limiter, it is necessary to inclose the fusible elements incorporated in the fusible joint in arc-proof shells of adequate design so as to confine the arc produced when one or more of the limiters is called upon to interrupt short-circuit current. This assembly is then covered with rubber insulation applied at the factory over the arc-proof shells which surround the copper portion. The resulting product is a preinsulated fusible crab joint.

Fusible crab joints are used at "multiple points," but at intermediate service boxes, where there is no necessity for limiter protection, it is the practice to use one of the several types of preinsulated non-fusible crab joints designed for the purpose.

One of the important advantages of this method of splicing is the flexibility obtained. Spare ends are usually available for connecting additional cables for mains reinforcements or services which may be required in the future. Even where such spare terminals are not available additional crab joints may be inserted in the ring bus to receive any new cables. This work usually can be done without disturbing the existing splices or the cables already installed. The advantages derived from this system are evident when it is compared with the conventional method of "breaking down" leaded joints for adding services or main reinforcements.

Limiter protection is provided for the cables joining the network protector to the grid by a fusible network protector terminal as illustrated. It is so constructed that it conveniently can be mounted on the network protector housing and takes the place of conventional terminals at this point.



Fusible terminal for network protector affords short-circuit protection for the cables connecting the network protector to the mains grid

ED. NOTE—In a later article, which will appear in an early issue of ELECTRICAL WORLD, the authors will detail the operating experience of Consolidated Edison Company with these devices.

Fuel Clauses—Are They Always Adequate?

Coal cost does not correctly state fuel cost in all conditions — Variation in cost per million B.t.u. a better index than in cost per ton — Suggestions for simple clause on B.t.u. basis

F. W. FOSTER, ***Rate Engineer Central Service Corporation, Chicago***

REPEATED analysis of the "fuel clause" under various wholesale and retail power contracts and schedules lead to the belief that this important item is often ill-defined. A study of available data discloses fuel cost components of a kilowatt-hour as determined from fuel clause provisions vary from 0.14 to 1.8 cents. Although it is not unreasonable that such range may reflect actual conditions, general familiarity with the efficiency of certain plants would indicate that as a matter of general policy, if for no other reason, the fuel correction clause should in many cases be revised. While complications incident to such revision are recognized, we believe they are potentially less troublesome than adherence to a clause that does not validly reflect the fuel component of production cost. Accordingly, suggestions are presented which may lead to more accurate delineation of this important cost factor.

Cause of Variations

A number of reasons other than fuel costs and plant efficiencies might account for the variations in fuel cost component already mentioned. Too often, under the pressure for speedy consummation of a rate study, consideration of the fuel clause may be subordinated, and it may eventually appear in the schedule without having been given adequate consideration. Although the wording of the clause almost invariably refers to fuel cost only, it may be the intent in some cases to cover production cost correction on the theory that, if fuel costs increase materially, other operating costs will probably follow the trend. It may be the belief that if the fuel clause correction is on the "safe" side, there is no cause for concern, particularly if the trend of fuel costs is upward. However, if there is a downward adjustment in the cost of present type of fuel, or if a change is made from coal to natural gas, the customer might receive a rebate out of proportion to the saving which the producer has made.

Correct Statement

The fuel clause may be correctly stated in a number of ways, although the author favors a correction stated in terms of cents per kilowatt-hour for each one cent, or major fraction thereof, variation in the cost of one million B.t.u. The primary reason for this lies in the fact that if a fuel clause is stated in terms of cost per million B.t.u., it is applicable to practically every class of fuel, whether coal, oil or gas.

For purposes of illustration, let us assume that the following data show the facts as related to a given electric utility:

Tons of coal used per year	61,160.74
Kw.-hr. generated during year	92,889,922
Average B.t.u. per pound of coal	13,178
Average cost of coal in bunkers —per ton	$3.26

From the above we can compute that:

1. The average pounds of coal per kw.-hr.	1.3168
2. Average B.t.u. per kw.-hr. produced	17,353
3. Average cost of coal per lb., cents	0.164
4. Average fuel cost per kw.-hr., cents	0.21595
5. Average base cost per million B.t.u., cents	12.45

If fuel costs change, then the new cost of this component of a kilowatt-hour may be expressed by the formula:

$$\frac{\text{New cost of fuel per million B.t.u.}}{\text{Present cost of fuel per million B.t.u.}} = \frac{\text{New cost of fuel per kw.-hr.}}{\text{Present cost of fuel per kw.-hr.}}$$

If, for example, the cost of fuel *increases* one cent per million B.t.u. over those shown above, then the new cost per kilowatt hour can be determined in accordance with the following equation:

$$\frac{13.45 \text{ cents}}{12.45 \text{ cents}} = \frac{X}{0.21595 \text{ cent}}$$

$$\text{and } X = 0.23329 \text{ cent}$$

Hence the increase per kilowatt hour is:

$$0.23329 \text{ cent} - 0.21595 \text{ cent} = 0.01734 \text{ cent}$$

for each 1 cent per million B.t.u. in excess of 12.45 cents per million Btu.

Simple Fuel Clause

Consequently, a fuel clause in its simplest form, using the above data, might read:

> There shall be added to or deducted from the net monthly bill computed according to the above schedule 0.01734 cent per kilowatt-hour for each whole cent by which the cost of coal used during the preceding month is more or less than 12.45 cents per million B.t.u. The "cost of coal" includes purchase cost, freight, demurrage, weighing, unloading, testing, rehandling in storage and delivery into the bunkers of the company's steam plants supplying this energy.

Practically, the above figures might be rounded out to show fewer decimal places, but such approximation should not be too generous, since a change from 0.01734 cent to 0.02 cent, for example, indicates a difference in efficiency of heat unit utilization of 15.3 per cent.

Conversely, in case we represent the purchasing company, we may work backward from the equation

[*Continued on page 53*]

Street Lighting in Kingston Increased 67 per Cent

Central Hudson Gas & Electric bill is increased only 14 per cent — Result of three-step, eight-year plan — Series circuit streamlined—Pole-type, constant-current transformers

Broadway in Kingston, N. Y., main artery of traffic on west shore of Hudson River, appears as bright by night as by day. Installation consists of G.E. pendant bracket luminaires of 1,000 and 1,500 cp.

IN KINGSTON, N. Y., a modern street-lighting system has been completed in the city's three business sections, giving this community of 28,000 population one of the best-lighted business districts in the country among cities of comparable size. The new ornamental system, with complete new equipment, including standards and luminaires, which was installed in the last two years, is the culmination of plans initiated in 1930. In that year the Kingston Chamber of Commerce organized a lighting committee to map out a consistent program of improved business street illumination, with the cooperation of the General Electric Company and the Central Hudson Gas & Electric Corporation, the utility company serving the region in which Kingston is located.

The actual lighting installation, however, was delayed by general conditions until 1937, when, under the leadership of Kingston's Mayor, Conrad J. Heiselman, action was started on this important project with the relighting of the main, or uptown, business section. This was the first of three divisions in the march of better light through Kingston's commercial area. It was followed the same year by the installation in the downtown business section. As a final step the project was completed with the new illumination of the midtown business section, which connects the two sections previously relighted. Along 3 miles of city streets in these adjacent commercial centers the new ornamental system forms a continuous route of high-intensity illumination that branches out into several streets in the main business locality.

In the relighting of the entire business area there were 269 new units installed, G.E. pendant bracket lumin-

aires with rippled glass globes, mounted on metal standards. In 136 of these units lamps of 1,500 cp. are utilized; in 129 the lamps are 1,000 cp., and four have lamps of 600 cp. In the uptown and downtown sections the ornamental poles are spaced 100 ft. apart and in the central section 135 ft. Mounting height of the luminaires is 22 ft. for those employing 1,500-cp. lamps and 20 ft. for those having 1,000 and 600-cp. lamps, spreading the light out to best advantage and preventing glaring rays from shining into the eyes of motorists and pedestrians. The 269 new luminaires replace 227 units, of which 195 were equipped with lamps of 1,000 cp., 31 with those of 600 cp., and one with a 250-cp. lamp. The new system provides a total of 335,400 cp., as compared with 213,850 furnished by the former installation, an increase of 121,550 cp. for Kingston's business districts.

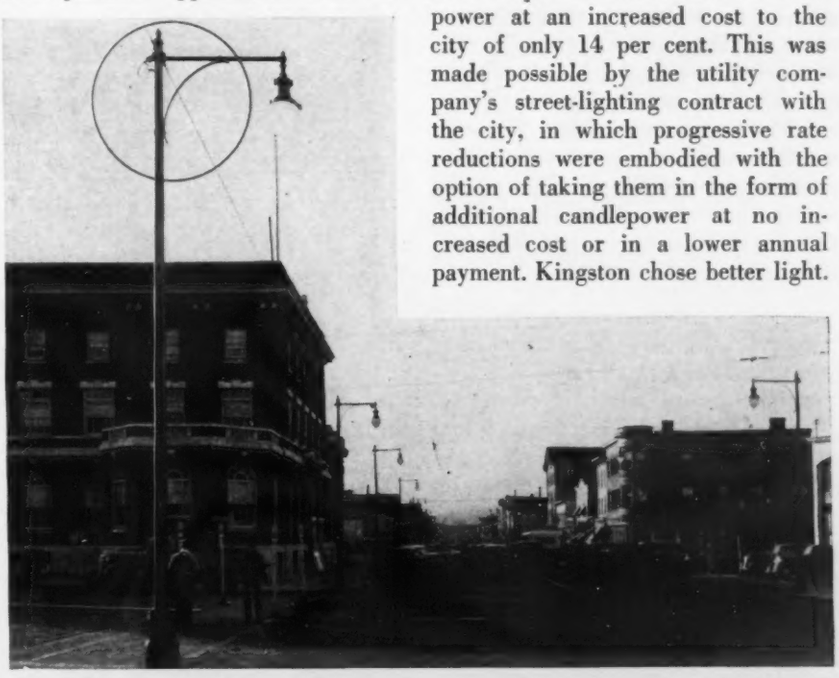
Overhead Supply

In the congested uptown section all the units are fed by underground circuits, the conduits for which were installed by the Central Hudson company in 1931 as part of its construction program to relieve local unemployment. In the other areas the current is supplied by single-series wiring running overhead and attached to the top of the new metal standards. The service poles there were removed from the main thoroughfares and new ones were located on side streets.

Of technical interest is the method of serving the new ornamental poles with a single overhead feed wire. At each pole the wire, which is No. 6 weatherproof, is brought to a special small strain insulator finished in green so as to blend in with the green painting of pole and fixture. A tap is taken from the insulator down into the weather head located on the side of the pole opposite the extension arm. The wiring goes to the fixture, back out through the weather head and up to another strain insulator set 180 deg. from the entrance insulator. The two insulators are supported by a split collar which is bolted around the pole shaft a short distance above the extension arm. This method of carrying the overhead wire offers the advantages of neat appearance and mechanical strength. The single wire "dies into" the body of the shaft and is less noticeable than a wire carried on a pole top or bracket-mounted insulator. The stress of the wire span is taken directly on the center line of the pole shaft. With this arrangement the community saves the annual rental charges for a costly underground cable system. At the same time installation and maintenance are simplified for the utility. As for appearance, the casual observer feels that the new section is just as "ornamental" as the older installation where the cable is underground.

As a part of the effort to get the best possible appearance with the overhead feed, it was thought desirable to eliminate the necessity for an individual lamp transformer hung or slipped on each pole. This was one of the considerations leading to the use of pole type, constant-current transformers with 20-amp. secondaries. These secondaries feed the loops connected directly to the 20-amp. lamps of 6,000 lumen, 10,000 lumen and 15,000 lumen rating.

This new business street lighting, coupled with other improvements in street lighting in various sections of the city from 1935 to 1938, resulted in a 67 per cent increase in candlepower at an increased cost to the city of only 14 per cent. This was made possible by the utility company's street-lighting contract with the city, in which progressive rate reductions were embodied with the option of taking them in the form of additional candlepower at no increased cost or in a lower annual payment. Kingston chose better light.



Split collar near pole top supports two small strain insulators, with short taps to weather head. Note four lamps in pedestrians' safety zone.

Farmer Schoof Is Sold*

Michigan farmer tells why he electrified his farm and cites figures to prove electrification profitable — More than this, he says life on the farm is equivalent to life in the city

By WILLIAM G. SCHOOF

I HAVE been requested to tell you what I am doing with electricity on my farm, and what the service really means to me. On a large farm the operator might not question the extensive use of electricity, but no doubt many of the farmers operating small tracts of land are of the opinion that in many cases electricity cannot be applied efficiently. I have proven to my own satisfaction that electricity if properly applied can be used very profitably on a small farm.

I have an ordinary dairy farm consisting of 120 acres and produce and ship milk to the Detroit market. My dairy herd consists of twelve purebred Holstein milch cows and four nurse cows. I usually maintain an average of ten head of young stock. This year I have 26 acres in wheat, 25 acres in oats, 25 acres in hay, 23 acres in corn and 3 acres in potatoes. The balance of the farm is in wood lot, pasture and space for the buildings. I do my field work entirely with horses and do not own a tractor. This will prove that I have an average farm and I am not doing farming on a large scale.

Service Since 1925

I received electricity at my farm on March 23, 1925, at which time I used the service principally for the lighting of the buildings, with the exception of an electric iron and a washing machine. Little did I think of installing any other electrical equipment until I attended an electric range and feed-grinding demonstration that was being conducted by the Detroit Edison Company in 1928. The electric range appealed to Mrs. Schoof and we made an installation in the spring of 1929. I also installed a pump jack on my water pump for pumping water to the stock tank and for the cooling of the milk.

It was at this time that I commenced thinking about how much electricity might relieve some of the drudgery in my farm chores, and in thinking over what had been discussed at the feed-grinding demonstration I decided that I would make a feed-grinding installation. I called the farm representative of the Detroit Edison Company and requested that he supervise a complete feed-grinding installation for me.

Start With Feed Grinding

I installed a 5-hp. hammer type feed grinder equipped with a blower fan in the granary and to make the installation more or less automatic, constructed bins over the old granary with ample capacity to store the average amount of grain that I thresh and grind each year. This bin arrangement consists of three bins, each having a capacity of approximately 500 bushels. The total investment for this installation amounted to $642.11 and the installation was completed in 1929. Now all I have to do in order to grind grain is to push the switch on the motor, open the flue from the overhead grain bins and go about doing my chores, upon completion of which my ground feed is ready.

My feed mill installation eliminated my spending half a day per week in sacking, loading and hauling the grain to the custom mill and back. I figure my annual saving in doing my own grinding, including the labor saved and the smaller cost in grinding amounts to $58.31. I have used my mill ten years now and the only repairs that I have had are $1.50 for a new bearing in the mill.

As my 5-hp. motor is of the portable type and equipped with 40 ft. of extension cable, I am able to use the same unit for several other jobs on my farm, one of them being the elevation of grain to the overhead bins, the grain being elevated directly from the threshing machine to the bins, which saves me two men at threshing time. It enables me to have the grain overhead for gravity feed to the mill for my year's grinding. The cost of elevating on an average of 1,500 bushels of grain amounts to about 93 cents for electricity.

The same motor is used for hay hoisting. I usually mow about 50 tons annually. My motor-driven hoist eliminates the hitching and unhitching of the team from the wagon each time a load is drawn in from the field. Although I do not save a lot of labor through this method, it is very convenient, especially in the event of a coming rainstorm in that the stowing operation is immensely speeded up.

No More Drudgery

Two jobs on my farm that Mrs. Schoof has always been glad were dispensed with are the threshing and silo filling. I have eliminated much drudgery for her by the system that I now use. I purchased a small used thresher and also a second portable motor of 15-hp. size. I can now do my threshing with a crew of three or four men, where under the custom method the job required approximately fifteen men. This eliminates the many meals that Mrs. Schoof was required to prepare, and also eliminates the exchange of labor with my neighbor farmers and gives me much additional time to work on my own farm and get the work done when it should be done.

Taking all things into consideration, including the interest and depre-

*Presented before Michigan Gas and Electric Association.

ciation on the equipment, I figure that I save annually $74.65. The cost of electricity in threshing my average 2,000 bushels of grain amounts to $11.18.

My silo-filling job works about the same way the threshing job does. I use only two or three men in doing my filling and, of course, save the preparing of the many meals and the exchange of labor again as was necessary under the old custom method. My annual saving in the silo-filling job amounts to $26.96.

Another job that I have for my portable motor is that of corn husking. I husk on the average of 800 bushels of corn each fall. This job is worked in between other farm jobs whenever time can be spared. I figure that I save $21.10 annually in being independent in doing this job. You can readily see that even though I am using large power units, yet, due to the fact that I have ample work for these units, I can use them profitably, although the jobs in several cases are seasonal jobs.

Eliminates 91 Days of Pumping

An application that furnishes us with outstanding daily convenience and comfort on the farm is the automatic pressure water system that has been installed to replace the pump jack. If I were required to pump water by hand, I estimate that the time required would amount to at least one hour in the morning and one hour in the evening each and every day in the year, or 91 eight-hour days at the pump handle each year.

Electricity does this job for me at about $1 per month, and if I were to figure my time at 30 cents an hour, even after deducting the depreciation and interest on the equipment, I figure that my water system pays me a net profit of $180.75 annually, not mentioning the elimination of carrying water to the house or the added profit received through increased milk production from having drinking cups before my cows.

These applications make up the major portion of the installations I have made that return a profit. The annual cost of electricity for doing all of these jobs amounts to $53.67. My total investment in the equipment mentioned amounts to $2,394.83. This investment includes the thresher, silo filler and corn husker. Although they are not pieces of electric equipment, they are necessary for making my operations independent. My total annual cost for doing the jobs under the custom method amounted to $656.15. My cost of doing these jobs under the independent method amounts to $293.15, which gives me an annual net saving of $363.

Conveniences in the Home

I have not only tried to reduce labor in doing my farm operations but I have also made an attempt to reduce the labor in the household for Mrs. Schoof. The $363 saving that I secure from my outside operations more than covers the operating costs as well as the depreciation and interest costs for a completely electrically equipped home.

In addition to the electric range, iron and washing machine, Mrs. Schoof also has an electric refrigerator, an ironing machine, a cleaner, a radio, a mixer, a teakettle, a toaster, a waffle iron, an automatic water heater and a complete bathroom. The investment in this equipment amounts to $1,789.74. The average costs for operating all this equipment amounts to $11.49 monthly, or $137.94 per year. Even after adding the interest and depreciation to this operating cost and deducting it from the profit that was received from the barn uses, I still have a net profit of $46.09.

I have just recently installed a milk cooler in the milk house and a dishwasher in Mrs. Schoof's kitchen. Never did we enjoy farming as much as we have since making our farm modern electrically. We feel that we have all of the advantages of a city home and that the farm is operated on somewhat the same basis as a factory in the city.

A farm equipped such as ours tends to keep the children content to remain on the farm and also tends to make the farm help content. Without electricity it is doubtful whether or not I would have remained in the farm business, but electric power has made farm life more attractive and removes our desire for any occupational change. I have farmed for 26 years and I started from the bottom and paddled my own canoe. I own my farm and keep a farm account book which shows a little profit each year.

We have had a great deal of fun setting these things up and I am a satisfied farmer today. We welcome everybody to our farm and we wish to thank the Detroit Edison Company for the very fine service we have received from it.

Fuel Clauses — Are They Always Adequate?

[*Continued from page 49*]

previously set up using only the fuel clause information to determine energy cost due to full component. Thus for each 1 cent in cost per million B.t.u. above 12.45 cents per million B.t.u. the kilowatt-hour charge would be increased 0.01734 cent, or the indicated fuel cost of producing 1 kilowatt-hour is:

$$\frac{1}{12.45} \text{ of } X = 0.01734 \text{ cent}$$

$$X = 0.21595 \text{ cent per kw.-hr.}$$

Although this is not conclusive as to the vendor's actual cost, it provides some basis for determining if the fuel clause appears acceptable.

B.t.u. Contents Not Specified

While the preceding paragraphs relate to a determination of proper correction factor, it should be noted that certain fuel clauses, although probably correct for the conditions existing at the time of their adoption, are not actually complete in that no reference is made to the B.t.u. content of the fuel. It is assumed that the operating company feels assured that coal of similar B.t.u. content will continue to be purchased, possibly from an associated coal corporation. In view of the changes occurring in corporate relationships, we feel that too much reliance should not be placed on such an assumption. Let us say that the present fuel clause states:

> The energy charge in any month is increased or decreased 0.018 cent per kilowatt-hour for each whole 25 cents of increase above or decrease below $4.75 per long ton in average cost of bituminous coal delivered at company's plant for the second preceding month.

If a new source of coal supply becomes necessary, and if for any reason the B.t.u. content decreases, say, by 12 per cent, but the price remains at $4.75 per long ton, the company cannot pass this virtual increase in cost along to the customer under the above clause, although it is the actual intent to do so.

Coordination of Equipment Rating with Performance

Nameplate ratings are often mis-informative in summations of system capacity because local conditions determine ability of equipment to deliver. Suggests system ratings to supplement manufacturers'

PHILIP SPORN, *Vice-President and Chief Engineer, American Gas & Electric Service Corporation*

PRACTICALLY all equipment, such as turbines, generators, transformers, or even lines forming part of a power system, has capacity or capability defined or specified, more or less correctly, by a manufacturer's nameplate. The nameplate, the exact wording or terminology of which has in most cases been determined largely from a legal rather than from an engineering or operating standpoint, has unfortunately too frequently been used as a correct index—in some cases as the final index—of what equipment will do. This has, in consequence, resulted in giving currency to a great deal of misinformation. It has even resulted in some cases in considerable service or economic loss on power systems. With the advent of numerous additional regulatory and supervisory bodies, each charged with checking some one or several of the many utility system operations into which rating of equipment enters, it threatens to do a great deal more harm unless some corrective measures are taken.

Not the Manufacturer's Problem

Basically it is almost impossible for a manufacturer's nameplate to serve as a sound criterion, and certainly not as *the* criterion, for equipment rating. The reasons for this are the numerous and varied factors that enter into consideration between the drafting of a nameplate and the performance of the equipment to which it is attached and which it generally is understood to describe.

For example: A standard turbo-alternator has its electrical end rated at 25,000 kw. 80 per cent p.f. Standard practice gives such a unit a steam end capable of handling the full output of the electric machine at unity p.f. If, therefore, the system of which the turbine is a part permits operation at 100 per cent p.f., then the machine is capable of generating 31,250 kw., even disregarding the normal overload capabilities of all well designed machines. The actual rating of this unit will depend, therefore, not only on system conditions, but on conditions in the boiler room, and the propensity or ability to take advantage of "stretch" in the machine.

Rating is a Puzzle

It is interesting to study this same machine operating in a system where difficulties with condensing water limitation are experienced. Or suppose an even more involved situation: Due to system instability it has been found necessary on the incipience of storm conditions to reduce the load on the turbine to 16,000 kw.; otherwise the danger of the machine pulling out of the system is too large. What in that case is the rating of the machine? If the answer to this question is that the condition cited is hypothetical it will have to be pointed out in rebuttal that neither the above nor the preceding conditions are at all unusual and that they have, besides, all happened on one or more power systems.

Before considering a possible answer to this question or rather series of questions, it may be well to cite an additional example or two in connection with hydroelectric apparatus. Consider a run of river hydro plant with three 10,000 hp.. turbines, each connected to a generator having a nameplate of 6,000 kw. at 80 per cent p.f. The turbines actually will develop 15 per cent over nameplate rating before getting into a dangerous cavitation region. The electrical end will develop 10 per cent above normal load without exceeding standard temperature rises. But when all machines operate at full rating, a capacity reduction of 5 per cent on the whole station takes place due to tailwater elevation. What in that case is the true rating of each machine and of the plant?

It is obvious that the problem of equipment rating is not a simple one. Certainly the questions raised are not even half answered by resorting to manufacturer's nameplates. The engineering and operating problems involved go beyond the limits of manufacturer's engineering knowledge and natural scope. They call for a knowledge of system plant, system engineering, and system performance that can be supplied only by those who actually design and operate power systems.

But a System Problem

Granting the complexity of the problem of equipment rating and its importance, the question next in order is: How to proceed in its solution? It has been suggested that manufacturers be required to furnish more comprehensive nameplates. But close examination of this suggestion will show the difficulties in the way of its execution. Not only is there the objection that manufacturers in trying to develop a more informative nameplate will, of necessity, be thrown into the field of utility system engineering, but an even greater obstacle to such a course will be the legal problems it will raise for the manufacturer. For example, any attempt by a manufacturer to tie rating of equipment to system will at once involve him in the predicament of what his liability would be when sys-

tem conditions changed or when a piece of equipment was transferred from one system to some other system. That he will not, therefore, choose to involve himself in such a difficulty must be as understandable as it is apparent.

There remains, therefore, only one other solution and that is an exploration of the problem by the utility engineers themselves. Undoubtedly the problem has sufficient ramifications to make difficult the satisfactory solution by one particular group working alone—no matter how extensive its experience. That inevitably means some committee, and an industry committee, because the problem as has been shown is basically a power system problem. But committees have a way of moving with more deliberation than speed. To contribute toward the latter, a proposal, based on some experience, is outlined here.

One way of solving the many-sided problem of rating of equipment is for each system to supplement the nameplate of the manufacturer with a nameplate of its own. The sponsors of the nameplate in that case would be the engineering organization responsible for the design of the plant or of that part of the plant involved in the equipment in question, or the operating company operating it, or a combination of the two. At any rate it would be a group definitely qualified to express reliable and authentic opinion as to the capacity or capability or performance of any part of plant or equipment for which it would issue a nameplate.

Problem Is Simplified

Once this is decided a great many difficulties in the way of a solution of the problem that would confront a manufacturer are automatically eliminated. For example: With contingent liabilities ruled out of consideration the problem of extent to which the nameplate would go in carrying or giving information disappears simultaneously and the extent and the limits to which information is carried would be only those set up by the available facts and the usefulness of such facts in any or all phases of operation.

Advantages of Local Ratings

There would be other advantages in such a course of procedure. Thus, not only can the facts be given that would be of use in the work carried out by outside and supervisory bodies that have an interest and responsibility in the operation and performance of the plant or system, but the organizations of the power system itself would benefit. For example: It is frequently found that some kind of artificial restriction based upon nothing more than a misinterpretation or too-rigid application of a manufacturer's nameplate has been set up in the operation of equipment and facilities. Such restrictions naturally would be eliminated by a nameplate worked out under the sponsorship of the engineering or operating organization of each particular system. And, as a matter of fact, each particular organization would cover in its nameplate the particular set of information that is pertinent to and has an effect on the operation, performance and rating capability of its own equipment.

A Case in Point

As an example of what can be worked out along that line it may be interesting to cite what has been worked out in this direction by one of the companies of those with which the writer is associated. In this particular case the question at issue was the rating of a group of hydraulic turbine alternators consisting of a hydraulic turbine having a guaranteed rating of 6600 hp. to which was attached an alternator that was initially bought as a 4800-kw., 80 per cent power factor machine. Eventual discussion with the electrical manufacturer lead to an agreement on the latter's part to rate the alternator at 6000 kva., 80 per cent power factor. This, however, it was felt, did not give the adequate and proper information with regard to the hydraulic unit which was bought with, and actually had, a considerable margin of expected overload. The detail design submitted on the alternator convinced the engineers that here, too, some overload capacity would be available in the generator. Accordingly after the turbine was installed, complete tests were made, including heat tests, on the entire turbine unit, as a result of which ratings differing considerably from those of the manufacturer were adopted under the sponsorship of the operating company. The final nameplate adopted under the operating company's name read as follows:

" HYDRAULIC TURBINE
Head 23 Ft. RPM 90
Maximum Continuous Output By Test 7050 HP
Nominal Continuous Output 6600 HP

ALTERNATOR
Phase 3 Cycles 60 RPM 90 Volts 4150
Maximum Continuous Output By Test 5000 K.W. 0.76 P.F.
Nominal Continuous Output 6000 KVA 80 P.F.
Do not operate above test outputs "

It will be noticed here that not only has the turbine rating been changed materially from the manufacturer's rating, but what is even more important, the alternator rating adopted on the basis of 95.5 per cent efficiency is exactly equal to and suitable to the output of the hydraulic end. Both have been coordinated.

The above example is a rather simple illustration of the principles that might be followed in a complete working out of the problem of equipment ratings. It is obvious that a great deal more work covering some of the more complicated equipment will be involved in a proper working out of the entire problem, but there does not seem to be any doubt that such work can be carried out successfully and that the same principles shown above can be developed to their logical conclusion. If a committee along the lines previously suggested would be set up sufficiently representative of the various aspects of utility system operation, it ought not to be very long before a complete analysis of the various phases of the problem would be undertaken.

Benefits Will Follow

To summarize: The problem here presented is not only a pressing one, the failure to solve which is raising today a great many difficulties for many operating groups, but the undertaking of the solution is well worth while from an economic standpoint. There does not seem to be any ground for doubt that when and if the problem is properly solved, great benefits all around would flow to every system from having a complete coordination between nameplate data and actual performance. The difficulties of such coordination on the part of the manufacturer seem to be insurmountable. It would appear, therefore, as if the only and the logical people to carry it out would be the electric utilities themselves.

Editorials

S. B. WILLIAMS, *Editor*

Interconnection for Transmission of Power or Power over Transmission?

THE ELECTRIC power industry last week took another forward step toward assuring the maintaining by and for the United States that preeminence in the field of power supply that it has enjoyed from the beginning of the art. It long has been recognized by those who have studied the problem that nowhere else on the face of the civilized earth has electrification been carried as far, nowhere has technology been pushed as close to the edge of the unknown, as in this country. In the field of integration and interconnection the utility industry has done a particularly outstanding job in developing the equivalent of more than half a dozen British "Grids"—but with this difference: that here in the United States these individual areas are all areas of continuous parallels of power sources and lines.

Nevertheless it has been recognized for more than three or four years that the job of interconnection is not done and that certain gaps probably still existed in the interconnection picture. More than two years ago, recognizing the difficulties inherent in the job of determining which of these possible gaps were or were not economically and operating-wise justified, certain members of the industry made specific proposals for setting up working area committees with the thought that each could study a particular actual working area known thoroughly to the members of that committee. Last June plans were completed for setting up such a series of committees as well as a central coordinating committee. The latter held its first meeting on Thursday of last week and completed its work of organization. It cleared the way for study by each working committee of its particular intra-area interconnections and of possible inter-area connections. The work, it is expected, will be pushed ahead vigorously and as rapidly as any complicated problem of that sort can be handled. It is certain that any conclusions and recommendations that will be arrived at will be thoroughly sound and practical—that they will be along the lines, in other words, of strengthening and buttressing the present adequate power systems.

This step is particularly significant in the light of the threatened development of a national emergency. Granting the importance of maintaining at the peak of reliability and availability the power systems of the United States, ought it not to be evident that from the standpoint of national defense the best course to follow is to leave the handling, including even the addition of possible further interconnections, in the hands of those most intimate with the development of these systems over the past 30 or 40 years? Certainly if adequacy of power supply or transmission of power is the question at issue that must be the case.

It is, however, possible that there are groups of some influence in government councils whose aim is predominantly not transmission of power in national emergencies but the power or control over transmission, and over generation and distribution, too, for that matter. Such a situation might serve to explain the hints and rumors of a planned nation-wide grid to—to what? If the creation of means of getting competitive power sources into existing centers is sought then new "grids" may be an answer—perhaps not the economic answer but an answer of sorts. But if the true aim is re-enforcing or strengthening the existing power supply facilities then most certainly the answer is not in introducing new and hurriedly created super-transmission systems, untried technically and unjustified economically. Rather national defense will be materially enhanced by awaiting the work and the results of such groups as have just been set in motion by the industry itself after careful deliberation. Results obtained by this route may not be so startling but are surer to be sound and practical.

Steam Station Economics

CIRCUMSTANCES dictating the design of power plants are hardly ever identical because local requirements and system flexibility vary. Nevertheless certain particular elements are often nearly alike and consequently data on the performance of stations of typical design are of immense help as guides for new designs. It is this which makes so valuable to the executive and the designer the collation and interpretation of data about a multiplicity of stations designed to meet a wide variation of conditions. Such is the steam station cost survey which has been presented at frequent intervals by ELECTRICAL WORLD.

Another of these roundups of station performance and design factors will be published December 2 in ELECTRICAL WORLD in response to several requests. Data are already in for upwards of 50 plants, more than twice as many as reported in the 1937 round-up of 1936 data. These plants are from all over the country and have a wide range in overall rating. Many have had new units installed within recent years while others merely reflect the betterment of performance which attended modernization of operating technique and auxiliary installations.

This much sought guide to designers of coming plants in its enlarged and more widely diversified scope

contains frank intimate data found nowhere else. Needless to say, the editors are grateful to those who have released and reported their station results in order that critical measures may be devised to test the probable efficiency of projected plant designs. Unit investment figures are particularly significant at this time and they are to be given for stations where the books have been revised to bring entries into line with the recent requirements of federal and state authorities.

City Applies to Private Management for Help in M. O. Problem

LOUISVILLE is supplying this week an interesting case in municipal ownership management. For years it has owned and operated a water works system which obviously was intended to produce revenue for the city.

A mayor's committee looking for ways of relieving the city of sinking fund deficits recommended that American Water Works & Electric Company—a management company in the privately owned utility field—be employed to operate the water works. The municipal system, the committee reported, had "excessive operating expenses" and "unbalanced rates." The expenses were excessive when compared to those of private companies in communities of comparable size.

Of course, this case proves nothing of itself, but it does bring up the question—what happens to a publicly owned property that is mismanaged? It can go on spending money and expanding far beyond the needs of the community and so long as it is politically managed, who is to stop it?

Louisville apparently is getting in the position where it must have money and it can no longer entrust the management of this property to political appointees. It's kind of tough for the public to have to wait for that to happen before it can have relief.

This is but another argument for regulation of all utilities, be they municipal or private.

Youth's Defeatist Attitude

BUD MIDDLETON is a young, bright boy from the Middle West who thinks that there is no future left for youth except working for the government. Everything has been invented. Jobs are scarce and what there are lead to nothing. He has the defeatist attitude, that destroyer of initiative, the greatest scourge of youth this country ever had.

But Bud's father takes him to the World's Fair and there his eyes are opened by the things science and industry are doing now and by the unsolved things that are being investigated.

This in brief is the theme of a motion picture being distributed by Westinghouse. Of course, it is a grand advertisement for the manufacturer, but what most young folks are going to see is not the advertisement but the thought back of it. It would be immaterial if the film were twice as commercial, provided it helped to shake young America loose from this dangerously defeatist attitude.

The future of American business lies in the youth of today. They must enter business with enthusiasm, with the knowledge that the opportunities of today are greater than those of yesterday, that there are more jobs than ever for men of initiative, vision, courage. Anything that can help to inspire our young men—this group that was so badly manhandled by the depression—will pay big dividends to private initiative.

Export Pitfalls

ELECTRICAL MANUFACTURERS with little or no foreign-trade experience are urged to go very slowly in making commitments. The pitfalls are so many that it is not unlikely that nine out of ten inexperienced manufacturers will lose their shirts unless they get help experienced in foreign trade.

A large number of new firms have sprung up over night, both here and abroad, for handling American foreign trade. Most of them, we are informed, are "gyps."

Undoubtedly the war, if continued, is going to bring a heightened foreign demand for American electrical products. Orders from abroad are going to be very alluring. Unless the goods can be shipped without any bad after-effects and the price collected in dollars promptly, there is little use in taking the order.

Fluctuating exchange, exchange restrictions, blockades, insurance, English blacklist, credit, are but a few of the problems in today's foreign trade. It takes an experienced organization, and one that can be trusted, to handle business profitably under such conditions.

Furthermore, the manufacturer who is toying with the exciting thought of adventure in foreign trade, a field new and strange to him, will do well to stop and consider what it is that causes cattle to break through fences. Distant pastures always look greener, but the cows usually find it is the same grass as that close to home. The only difference is that they have to go farther for it. With domestic markets reviving as business improves, productive capacity will find an increasingly demanding market in this country.

In 1914, when war broke out in Europe, American manufacturers got themselves all hot and bothered about the possibilities of export trade. They saw the industrial countries of Europe too busy with war to pay attention to foreign commerce. They saw the combatant nations with industrial capacity employed in munitions production and needing consumption and capital goods from the United States. They saw OPPORTUNITY, just like that, spelled out in capital letters. But it wasn't. It all petered out to little or nothing when business in this country got to going good after the 1913 depression.

Therefore, American manufacturers should "Stop, Look, Listen" before they rush into an export frenzy.

War Industries Board Demise Casts Shadow

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

GETTING READY for war, but abolishing the War Industries Board! Curious? Reconditioning world war destroyers, whose only worthwhile function would be hunting submarines. Putting the old Hog Island freighters in condition in order to thwart the submarine. Recruiting the army and marine corps so as to have plenty of non-coms for an army which might be sent abroad. But getting rid of a board which has planned industrial mobilization and has given just enough study and application to the job so that in a little while it might be efficient!

Mind you, this thing was not done with the approval of the War Department. Or of any military people so far as Washington observers can discover. On the contrary, they are all aghast. As this is written, the President has not made public his reasons for taking this extraordinary step. All that we are able to discover is the reasons privately admitted by the persons we know to be his advisers.

The reasons they give privately for their opposition to the War Industries Board (to the accomplishments of which Assistant Secretary Louis Johnson was pointing with pride in an undelivered speech scheduled for a date *after* the Board's death, but obviously written before he knew the board was to be purged) are simply that the board contained no representatives of labor!

Could Add Labor Representation

No representatives of labor! As though it would have been impossible, were that the only objection, to have added labor representatives to the board! And after all the crocodile tears, during bonus debates in Congress during the last two decades, about the $30 a month paid drafted soldiers as against the high wages and easy jobs of the men in shipbuilding and other war industries!

To be perfectly fair and honest about it, shrewd observers in Washington do not suspect for a moment that the failure of the board to include labor representatives was the real explanation of the drive which has succeeded in abolishing this industrial war plans organization. Observers do not believe that the Corcorans and Cohens are so stupid.

The real motive was and is antagonism to war plans which permit the continuance of the operations of the present capitalistic system. The plans of the board did not provide for government-owned and operated plants; they sought to utilize existing privately owned plants and to allow for their expansion. There was no provision giving dictatorial powers to existing government agencies *now controlled and operated by left wingers.*

Not Radical Enough

There was entirely too much planning for putting control of the production of war supplies under the departments directly interested—war and navy. Left wingers believe the economic ideas of the generals and admirals date back to the Spanish war period. Indeed one hears talk of "embalmed beef" of 1898 notoriety, whenever one listens to a little group of the starry-eyed boys talking about how the next war must be fought.

It is fair again to say that the left wingers think their kind of war organization would be more efficient —would produce better and more munitions and supplies at a smaller cost to the government. But it is somewhat disturbing to hear from their own lips that this is only one of the reasons why the government should be virtually socialized—though they avoid this word. Another, and it would seem a more important reason to them, is that involvement of the United States in the war, if and when it comes, will be a great opportunity to accomplish economic reforms in this country which might come much more slowly under peace time conditions.

It is no secret, of course, that the left wingers contemplate the taking over of the entire electric utility industry, so that no one in this country could use the current save by buying it from a government agency. And it is common knowledge to those who consort with the left wingers that they think this "reform" is long overdue.

Again it is fair to say that the left wingers think a government monopoly of the electric industry would be enormously to the advantage of the people as a whole. But it is also obvious to outside observers that the individuals in favor with the left wingers would not be wholly without benefit by such a development.

Utility Nationalization Charted?

Indeed there are more than whispers about a chart which gives just who would be what in the management of the various utilities of the country once they were taken over by the government. Not having actually seen the chart, the writer is unable to say whether the salaries which would be allowed such positions are included. But probably not.

There is a strong disposition on the part of the left wingers, from Roosevelt himself down, to disapprove large salaries—except for "our fellows." And, as "Chip" Robert discovered to his outraged amazement, not even to all of "our fellows" unless they are friends and admirers of certain sitters in the seats of the mighty.

Don't Adjourn Politics

Let's hope that politics will not be entirely "adjourned" so long as people, eager to risk the fate of this country in war in order to push forward their economic experimentation, actually have enough influence with the President to obtain the abolition of the War Industries Board!

NEWS OF THE WEEK

Utility Engineers Study Power Interconnections

Central committee meets at E.E.I. headquarters to plan comprehensive survey to insure continuity of service—Twelve working groups are formed to work out details—Will meet again this month

The electric utility industry is undertaking a comprehensive and detailed study of the interconnection situation in the United States and the making of interconnections as might, in the light of the latest developments, be justified from an operating economic viewpoint or from the standpoint of insuring continuity of service.

At the meeting of the central committee at the Edison Electric Institute in New York last week organization plans were made. The committee is to meet again late this month at which time reports will be made on the findings in the twelve working areas.

Job Is Complex

Utility engineers point out that the job is particularly complex and involved. It has been recognized that no one central organization, no matter how well-informed, can carry out the job of this magnitude and complexity except at the sacrifice of detailed knowledge of local conditions, and therefore practicability.

While it is hoped to cover all of the geographical regions of the United States, it is felt that for present purposes, and because of the magnitude of the job, it would be well to confine the study to the heavy power area covering the territory east of the Mississippi River and north, roughly, of the TVA area. This section of the country is divided into twelve working areas covering the procurement areas of Boston, Bridgeport, Schenectady, Buffalo, New York City, Philadelphia, Baltimore, Pittsburgh, Cleveland, Cincinnati, Detroit, Chicago, Milwaukee and St. Louis. Approximately 65 per cent of the installed generating capacity of the country is in this area.

The bases of these areas are the existing working boundaries covering a group of power systems that at the present time are already closely interconnected and are working in close coordination.

It is proposed not only to study through the medium of a local committee of the best engineering talent available in the local areas the intra interconnection problems, but also through cross committees between areas to study the inter-area interconnection possibilities that may have been overlooked in the past or that may have developed as feasible in the light of the latest system and technological developments.

As a means of guiding and helping the area committees a central or general steering committee has been organized consisting of the chairman of each of the twelve working areas, plus three or four members at large.

Committee Members

The make-up of the committee includes K. M. Irwin, Philadelphia Electric, chairman; Philip Sporn, American Gas & Electric; E. S. Field, Cincinnati Gas & Electric; H. C. Forbes, Consolidated Edison Co. of New York; J. W. Parker, Detroit Edison; Edmund C. Stone, Duquesne Light; G. K. Miltenberger, Union Electric, St. Louis; W. C. Bell, New England Power Association; B. L. Huff, Commonwealth & Southern; V. N. Marquis, American Gas & Electric; R. E. Dillon, Boston Edison; Howard L. Harrington, Buffalo, Niagara & Eastern Power; M. D. Hooven, Public Service Electric & Gas; F. E. Ricketts, Consolidated Gas Electric Light & Power of Baltimore; E. S. Fitz, Virginia Electric & Power; L. F. Seybold, Wisconsin Electric Power; W. M. DeMerit, West Penn Power; and Norman C. Gibson, Niagara Hudson Power.

This committee came into being last June following suggestions made by Mr. Sporn in a speech before the E.E.I. convention in 1937 in Chicago. Its makeup is such that it is in a position not only to carry through the basic objective for which it has been created, but also to serve during emergency, should one develop, as a means of bringing the closest kind of co-ordination between the areas that will be particularly concerned and particularly involved in national defense, when and if the national emergency should develop.

Because individual studies of interconnections have been made before,

Two Utilities Order Turbo-Generators

America need have no fears of an electric power shortage should an emergency arise, judging from the rate utilities are ordering new generating capacity.

This week Public Service Electric & Gas Co. and Georgia Power Co. ordered new units. The New Jersey utility placed an order for a 50,000-kw. unit and two high pressure boilers for its Marion generating station in Jersey City. This is part of a $7,500,000 program for the station. A new 100,000-kw. unit is now being installed in the Burlington station and will be ready for operation in 1940.

Georgia Power ordered a 35,000-kw. unit to be installed in a new plant at Macon. Building of the $4,000,000 steam-electric generating station is the largest single construction activity undertaken by the company in the past ten years.

the great amount of work necessary in such a broad study being made by the committee has been somewhat simplified. A re-examination will be made in the light of existing conditions.

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Plan Separate Operation for Willapa Properties

Pacific County Public Utility District Commission at South Bend, Wash., has announced that it is prepared to buy and operate the Willapa Electric Co.'s system independent of the West Coast Power Co.'s properties. The district, several months ago, signed purchase contracts for properties of both utilities under a tentative agreement with the Bonneville Administration.

Because the Bonneville Administration's plans are still in the formative stage, Mr. Schultz said the district has signed a contract with the Bonneville board to buy a minimum of 1,000 kw.-hr. at the Raymond substation, and operate the Willapa Electric system alone, awaiting negotiations for the West Coast properties.

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Prefers Utility Service

A delegation from Waxhaw in Union County, North Carolina, has asked Utilities Commissioner Stanley Winborne and Dudley Bagley, director of the Rural Electrification Authority for North Carolina, for permission to withdraw from the Union County Membership Corp. and use facilities of the Duke Power Co.

Joint Industry Effort Seen Accomplishment Key

Utility leaders urge more self-reliance and aggressiveness in furthering progress—Optimism prevails at meeting of Indiana Electrical Association—Elect Gallagher new president

The joint efforts of the electric utility industry should solve common problems, delegates to the Indiana Electric Association were told at the annual convention of the association in French Lick last week. Utility leaders urged more self-reliance and aggressiveness with emphasis placed on increased loads and larger sales.

A spirit of optimism spread through the convention as speakers pointed to the accomplishments of the industry and to current opportunities. President C. B. Calvert reported on the progress of the association during the year. Fritz Ehling reported for the accident prevention committee. The safety aspects of using chains for temporary grounds were questioned. Work is being done to develop safety helmets and a survey showed that it is current practice to use rubber gloves for line work up to 6900 volts.

Utility Progress

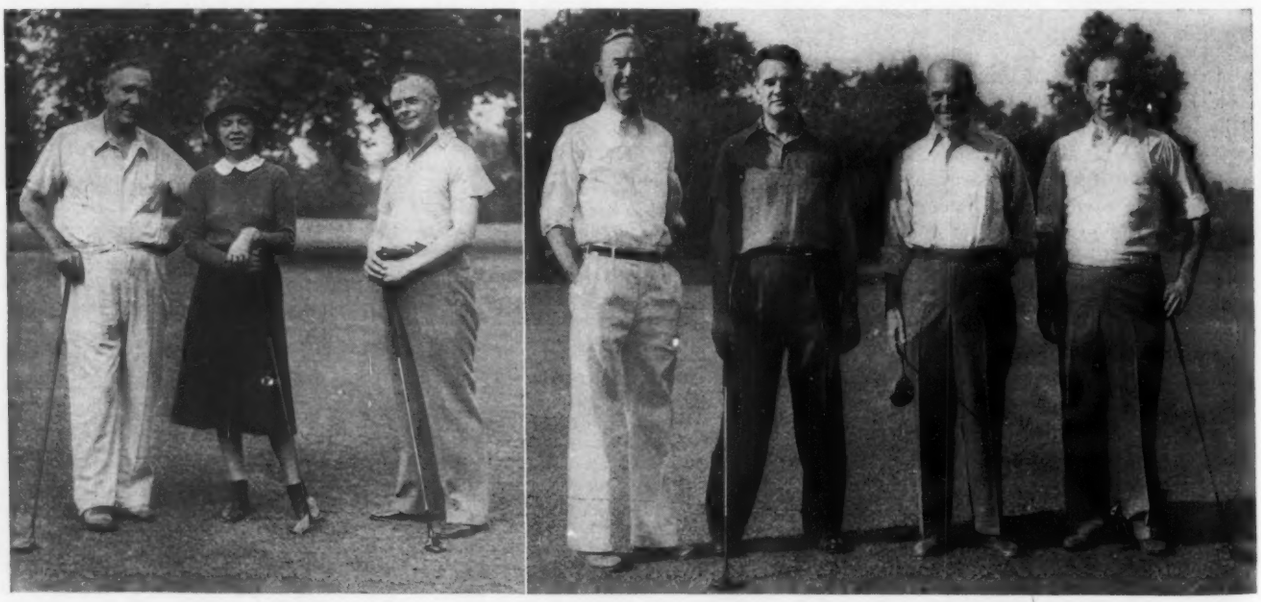
No industry has carried forward its work under such a storm of criticism and punitive action with such a record of accomplishment, Paul S. Clapp declared in discussing utility progress. He said that the industry has lowered prices, improved and extended service, developed and sold new appliances and produced and outstanding record since 1929.

This accomplishment has not been recognized, Mr. Clapp declared, and the government has harrassed the industry, increased its tax burden, and spent money to compete with it.

Mr. Clapp warned that the present tendency towards centralization in government and government participation in industry was breaking down the most precious heritage—the concept of personal liberty upon which this country was built. He said that in Europe millions of people have surrendered their freedom in the hope of economic security and this false doctrine is getting many converts in this country.

Rural electrification in Indiana is proceeding at a fast rate, reported J. M. Pearce of the rural electrification committee. Both REA and utility projects are being built rapidly and by the end of 1940 more than 100,000 Indiana farmers will be served.

Electrical manufacturers need to raise their sights, said Carl M. Snyder. He pointed out that since 1929, although a great gain in the number of appliances sold had been made, the dollars spent by the average family for appliances had decreased. The low-price-of-appliance complex was not



INDIANA ELECTRIC ASSOCIATION—Seen during the meeting of the association last week at French Lick were: Tom K. Polk, association president; Mrs. Paul Clapp, Paul Clapp, Columbia Gas & Electric; E. F. Whitney, General Electric; J. J. Trainor, Indiana Public Service; Charles W. Kellogg, president of Edison Electric Institute, and C. E. Lakin, Greenville Power & Light

beneficial to the industry. He suggested more emphasis on better electrical living.

Charles W. Kellogg, president of E.E.I., said that there are new frontiers for the electric utilities to conquer. The industry is still young with many opportunities ahead, he said, and it is hoped it will go forward, despite handicaps, on the basis of using courage and self-reliance to overcome obstacles. "Today we need only the spirit and courage of the frontiersmen to go forward in this country."

Pointing out that there is unity in the industry, N. G. Symonds declared that there are many common problems calling for joint action. He cited situations as the code, uniform ordinances and the adequate wiring problem as typical projects where all branches of the industry work toward the same goal.

H. F. Barnes reported progress in lighting and urged greater efforts in this direction.

General Smedley D. Butler debunked war and urged everyone possible to prevent the United States getting into the European conflict.

S. A. Anderson related experiences with adequate wiring. W. A. McDonough reported the complexity of modern accounting. George F. Switzer told of the value of the young men's meeting.

More than 400 delegates attended the meeting at which R. A. Gallagher, president of Public Service Co. of Indiana, was elected president; H. T. Pritchard, president of Indianapolis Power & Light, vice-president, and R. E. Blossom, secretary-treasurer.

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Pennsylvania Power Holds Cooking School

Modern home makers in capacity crowds attended the recent electric cooking school conducted in Sharon by Pennsylvania Power Co. in cooperation with the Sharon *Herald* and the Westinghouse appliance dealers.

A modern Westinghouse electric kitchen was installed on the auditorium stage of the Sharon High School where cooking demonstrations were conducted during the four-day session. The school drew considerable interest from housewives as well as home makers employed in business. Every type of modern electrical kitchen appliance was demonstrated to show the efficiency and advantages afforded.

More than 3,900 attended the sessions at which home economists cooked meals in addition to demonstrating a complete line of laundry equipment. Rufus Moses, Sharon district manager, said that the school was a success.

Engineers in Southeast Discuss Utility Practices

Operators hear reports on reclaiming oil, control of expenses, rural line experiences and merits of series capacitors—Discuss switchgear modernization at Southeastern Electric Exchange meeting

Effective operation of rural lines, economical reclamation of apparatus oil, and systematic control of operating expenses were major themes discussed at the meetings of the Engineering and Operation Section of the Southeastern Electric Exchange in Atlanta last week. More than 75 members from Maryland to New Orleans participated in sessions led by Chairman R. I. Butterworth of East Tennessee Light and Power Co.

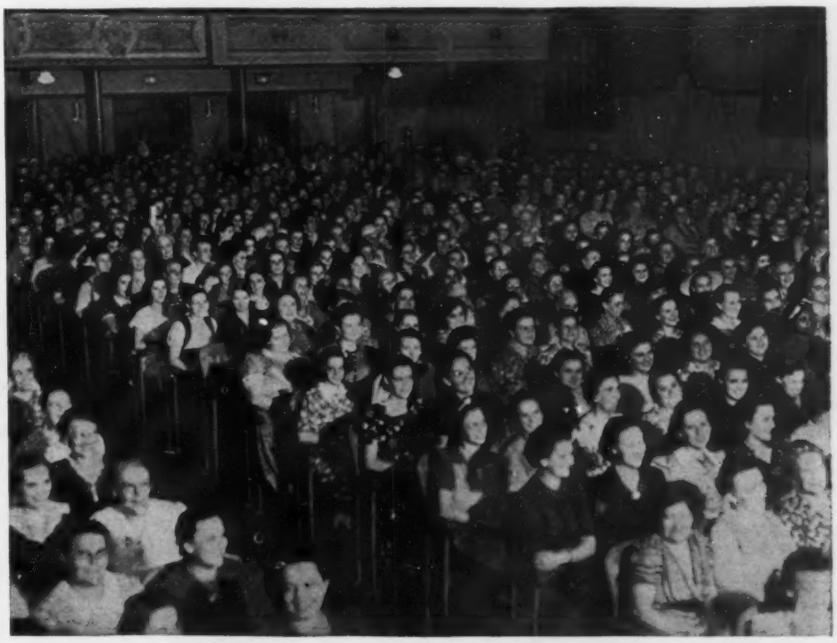
Series Capacitors

Amplification of his paper on series capacitors in the September 23 ELECTRICAL WORLD was presented by C. C. Moler of Potomac Edison. He said his company favored them even if the protection should fail, and the capacitors might fail, because his had paid for themselves in two years by the gains in voltage regulation. Current protection is preferred to the voltage protection thus far offered by manufacturers. Small and medium load circuits are the best application. Resonance and harmonics had caused no trouble. Discussion developed the suggestion that the appeal of step regulators had obscured the potentialities of series capacitors.

Purchase of 20,000–25,000 gallons of new insulating oil annually by Georgia Power Co. is expected to drop to 15,000–18,000 gallons as a result of reclaiming apparatus now in active service. P. D. Cunningham and J. F. Pennington stated the cost of reclaiming about 900 gallons in 24 hours is not in excess of 10 cents per gallon including transportation to the treating shop. Tri-sodium phosphate (90 pounds in 60 gallons of water) in conjunction with the solvent Retrol (one pound to 2½–3½ gallons of oil) in conjunction with washing, centrifuging and filtering bring the following typical results; neutralization number 0.05 to 0.08, color number 6 and power factor 0.2 to 0.5 per cent.

Activated alumina was reported used by Joel Tompkins (Nantahala Power & Light) and J. F. Rader (So. Carolina Electric & Gas) but one of the authors contended that that treatment did not correct the acidity.

An excellent resume of experience and conclusions in operating extensive rural lines was presented by L. C. Flournoy, Alabama Power Co. superintendent of distribution; in it he began with basic company-customer policy and ended by advocating the building of substantial lines that would be



GOOD COOKS—Capacity crowds of modern home makers attended the recent electric cooking school at Sharon, Pa., conducted by Westinghouse appliance dealers, the Sharon *Herald* and Pennsylvania Power Co. Total attendance was 3,900.

equally a source of satisfaction to customers and of profit to the company. Unsettled questions were the outlays for sectionalization and lightning protection; there is definitely a market for a reclosing breaker suitable for a 300–450 kva. substation and costing less than $1,000. Insulators of 17 kv. on 6.9 kv. lines (steel pins) have been puncturing too frequently. Winding failures on small CSP transformers in 1938 were 233 kva. (46 units) out 31,053 kva. (7,509 units). Loose hardware, clamps and connections are the root of radio trouble; adequate insulators seldom.

Many arresters are blowing up and socket meters are adversely affected by lightning said G. M. Nelson (Eastern Shore) in discussion. Reduced travel mileage to restore service made H. A. Crumley (Virginia Public Service) a firm believer in repeater fuses; he said it cost about $4.50 in his territory to replace an average transformer fuse. Tompkins called Thyrite protection of meters economical even at a $6 outlay. H. G. Harvey (Westinghouse, Atlanta) stated that Flournoy's reported failure rate of CSP transformers was about twice the national average, readily attributable to the high isoceraunic level of the Southeast.

Cost Reductions

Effective control of operating expenses, said H. B. Sargent (vice president, Mississippi Power & Light) begins with comprehensive factual knowledge, preferably graphed for the 10 years preceding. This will show how serious are the current trends as to rates, revenues and expenditures. Next it is necessary to ascertain the public attitute and responsiveness to possible planned activities. Such plans must embrace all departments and they must be expressed in terms of specific objectives for sales, relations, expansion and maintenance. There must be a continuous and critical check-up of progress and objectives. Personnel is a crucial problem and many of today's problems, he said, would be non-existent if proper men had been selected and trained for responsible positions a decade back.

C. B. McManus (Georgia Power) cited substantiation of this in the accomplishment of his company in cutting automotive costs $100,000 a year without harm to service; $200,000 yearly is now being collected for appliance repairs once free.

At a luncheon hour W. E. Mitchell (vice president, Georgia Power) urged a critical attitude on all traditional procedures. It is an essential present need for future security and benefits, he asserted, that the utility industry be diligent in selecting and training men for responsible positions where guessing is not to be tolerated.

The probable effect on the utilities of war activity in the United States was discussed briefly by A. E. Knowlton of ELECTRICAL WORLD.

Evolution of modern switchgear was traced by J. D. Hoffman of General Electric (Philadelphia) and he emphasized modernization of existing breakers as well as the trend to oilless equipment. J. F. Harrison (Mississippi Power & Light) said it was difficult to get executive authorization for modernization of breakers and P. F. Hoots (New Orleans P. S.) stressed the fact that there was little that could be modernized as readily as breakers.

Discrimination between recovery voltage, switching transients and surges was treated in a technical paper by R. L. Witzke (Westinghouse) with conclusions as to resistance vs. reactance grounding of system neutrals Petersen coils must be shorted, be warned, before switching off a faulted line.

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Nebraska Utility Signs Power Purchase Pact

A contract for the purchase of power from Nebraska's three federally-financed hydro projects has been signed by Nebraska Power Co. The contract when fully effective, means that Nebraska Power will purchase from 40 to 50 per cent of its needs from the projects. It will net the projects about $300,000 the first year and approximately $600,000 a year ultimately.

The agreement brings to a close a bitter controversy throughout the state in which public ownership advocates, backed by Senator Norris, sought the purchase of all private utility facilities. It also marks another step taken by the utility industry in purchasing power from government projects in an effort to make them financially solvent and to dispose of surplus power.

Nebraska Power is the second American Power & Light subsidiary to make power purchase agreements with federally-financed projects. Recently Texas Power & Light signed a contract with the Lower Colorado River Authority.

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Contracts for Power

The Tri-County public power district in Nebraska has contracted with the municipal plant at Hastings for its dump power in order to fulfill a contract it had with the Southern Nebraska Power Co. Tri-County is not yet in production, but had been supplying the Southern with power purchased from the two other public power projects. These were unable to supply the current because of low water.

Will Buy Facilities in Thirteen Towns

Lower Colorado River Authority has announced that it has reached an agreement with the Central Power & Light Co. for purchase of facilities in 13 towns and that the price would be determined when engineers complete their estimates. Towns involved in the deal are Waelder, Flatonia, Moulton, Englc, Hochheim, High Hill, Moravia, Praha, Schulenberg, Sealy, Cuero, Gonzales and Fredericksburg.

According to the Authority, new industrial and commercial rates for the group of eleven communities previously purchased by the Authority from the Texas Power & Light Co. are 20 per cent below and the domestic rates 37 per cent below those formerly in effect in those towns.

The Authority said that the rates established for the eleven cities will not be applied to unincorporated towns, incorporated cities of less than 400 consumers and rural users which will purchase LCRA power. Rates for these consumers will be determined soon.

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Indiana Service Opens Leisure Electric Home

Indiana Service Corp. has opened to the public a model electric demonstration home in its headquarters building at Fort Wayne. Known as the Leisure Electric Home, it was designed to provide the residents of Fort Wayne and vicinity with a broad concept of the part modern electrical appliances can play in homes of different income classes. (Pictures in Sept. 30 issue should have read Indiana Service Corp.)

Four all-electric exhibit kitchens, each built for a different salary bracket and containing major electrical appliances and displaying modern lighting effects, make up the major part of the demonstration home. In addition, there is a lobby, traditional living room, dining room and auditorium. A modern all-electric kitchen is on the stage of the auditorium together with a fluorescent lighting display. A commercial service kitchen, model laundry and home supervisors' offices complete the exhibit, which some observers regard as one of the finest exhibits of its kind in the Middle West.

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Signs Wolf River Bill

Governor Heil of Wisconsin has signed a bill permitting the construction of a dam on the Wolf River and creation of a reservoir near Lily by the Wolf River Reservoir Co.

Technical Problems Hold Attention of Engineers

Great Lakes District of AIEE meeting draws more than 200 engineers for discussions of electrical machinery control, measurement and protection, and operation of transmission and distribution

AIEE President F. M. Farmer

Vigorous discussion of technical problems of electrical machinery control, electrical measurement and the protection and operation of transmission and distribution marked the annual meeting of the Great Lakes District of the AIEE held last week in Minneapolis.

At the electrical machinery session E. W. Swanson, Electrical Machinery Co., described a magnetically-operated polarized field frequency control for applying field excitation to synchronous motors.

Synchronous Machines

B. Van Ness, Safe Harbor Water and Power, reported success in using a method of coordinating control of synchronous machines to correct trouble arising from too coarse steps in the main exciter field rheostat of a synchronous condenser.

High point of Thursday's session on selected subjects and measurement was a joint paper on protector tubes for power systems by H. A. Peterson, W. J. Rudge, General Electric, and A. C. Monteith and L. R. Ludwig, Westinghouse. This paper is a forerunner to standardization of protector tubes by the two companies.

In the discussion, A. D. Forbes, Westinghouse, outlined the fundamental differences between protector tubes for transmission lines and De-ion gaps for transformer protection. M. C. Westrate, Commonwealth and Southern, suggested use of tubes in stations to displace rod gaps on 44 kv. isolated neutral systems and 22 kv. grounded-neutral systems. He recommended that longer tube life be sought and suggested publication of a volt-time breakdown curve for protector tubes.

F. E. Andrews and H. A. Cornelius, Public Service Company of Northern Illinois, characterized their protector tube experience as "generally successful" with marked reduction in certain types of lightning trouble. They reported 19 tube failures, due apparently to excessive internal forces, out of a total of 588 tubes on a portion of their 34.5 kv. system. Regarding the effect of tubes upon high speed (one cycle) relay operation on their 34.5 kv. system they reported two relay operations known to be due to tube operation, four relay operations probably due to tube operation and at least six tube operations accompanied by relay operation. They stressed the fact that this latter figure was probably much lower than it should be.

Pilot Wire Relaying

At Friday's transmission and distribution session a paper by R. M. Smith and M. A. Bostwick, Westinghouse, described a new development in pilot wire relaying which was claimed to reduce the number of pilot wires and widen the range of economical application of pilot wire relaying.

W. R. Brownlee, Commonwealth & Southern, in discussion, pointed out that many of the serious objections to potential-operated directional relays had been overcome with recent improvements in potential transformer designs. R. E. Cordray, General Electric, pointed to the possibility of faults on the two pilot wires of the system causing erroneous operation of the relay. L. F. Kennedy, General Electric, questioned the application of the device to tapped lines, suggested by the authors, because of the limitations of the pilot wire scheme. T. G. Le Clair, Commonwealth Edison, reported that as regards faulty operation due to trouble on pilot wires, the operating record of pilot wire relaying systems on this Chicago system had been nearly 100 per cent.

In discussing T. G. Le Clair's paper on arc furnace loads on long transmission lines, in which the author described solution to a specific problem through use of a synchronous condensor, both L. W. Clark, Detroit Edison, and H. P. St. Clair, American Gas and Electric, cited experience with similar problems. Clark described a case where a synchronous motor-generator set was used instead of a synchronous condensor. E. S. Fields, Cincinnati Gas and Electric, described the successful application of synchronous motor-generator sets to the solution of a similar problem involving a steel rolling mill served at 66 kv. and subject to 25,000 kw. swings. W. B. Wallis, Pittsburgh Electromelt, stated that the case described by authors showed that economical solution of arc furnace supply problems was possible.

DISTRICT MEETING—Seen at the Great Lakes A.I.E.E. meeting at Minneapolis last week, (l. to r.) M. F. Schoenfeld, Indiana Service; C. M. Summers and F. H. Fleisher of General Electric; A. H. Lovell, University of Michigan; Dr. Phillips Thomas, Westinghouse; Walter H. Wheeler, consulting engineer of Minneapolis; and A. G. Dewars, Northern States Power

Scranton A.I.E.E. Meet Plans Are Completed

Final preparations have been made for the Middle Eastern District A.I.E.E. meeting to be held in Scranton, Pa., October 11-13. An attractive program of technical sessions and inspection trips has been arranged.

Inspection trips will be made to the Marvin anthracite-coal mines of the Hudson Coal Co., International Correspondence School, Wallenpaupack hydro-electric plant of Pennsylvania Power & Light, Hazard Insulated Wire Works of Okonite Co., and the Stanton steam plant.

The highlight of the meeting will be an address by Raoul E. Desvernine, president of Crucible Steel Co.

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E.E.I. Announces Plans for Committee Meetings

Program for the fall meeting of the transmission and distribution committee of the Edison Electric Institute to be held at The New Ocean House, Swampscott, Mass., October 10-11, has been announced. Following meetings of subject committees on Tuesday morning, October 10, a joint session will be held with the electrical equipment committee in the afternoon. Philip Sporn, American Gas & Electric Service Corp.; E. M. Hunter, General Electric Co.; L. W. Clark, Detroit Edison Co.; J. H. Foote, Commonwealth & Southern; A. E. Silver, Ebasco Services, Inc., and A. A. Lipschutz, Philadelphia Electric Co. will be among those on the program.

The Accident Prevention Committee will meet on October 13 and 14 at the general offices of the Institute in New York.

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Sets Hearing on Hydro Project in Connecticut

Federal Power Commission, on its own motion, initiated proceedings in which the Bellows Falls Hydro-Electric Corp. and Connecticut River Power Co. were named as parties respondent to determine whether a license is required for the operation of the hydro-electric project on the Connecticut River at Bellows Falls, Vt. The respondents were ordered to file their responses by October 18 and a hearing on the issues involved was set for October 23.

At the same time the commission consented to the withdrawal by New England Power Co. of an application seeking authorization to acquire the electric facilities of the Bellows Falls Hydro-Electric Corp. and certain appurtenant transmission lines of the Connecticut River Power Co. and accordingly dismissed the hearing previously set for September 25.

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Commission to Intervene

Federal Power Commission has permitted the people's counsel of the Maryland Public Service Commission to intervene in an investigation of the Safe Harbor Water Power Corp.'s charge for electric energy sold to the Consolidated Gas, Electric Light & Power Co. of Baltimore and the Pennsylvania Water & Power Co. Hearing has been set for October 9.

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Vote Utility Franchises

By a majority of more than 400 votes Iowa City residents, in a special election held recently, granted two fifteen-year franchises to the Iowa City Light & Power Co. for the distribution of electricity and gas and ended a dispute that has received state and national attention for the past seven years. Final unofficial tabulations from the nine precincts in five wards gave the electricity franchise a 2,763 to 2,331 majority.

MEETINGS

Edison Electric Institute—Electrical equipment committee, New Ocean House, Swampscott, Mass., October 9-10; transmission and distribution committee, New Ocean House, Swampscott, October 10-11; annual national accounting conference, Edgewater Beach Hotel, Chicago, November 13-15.

International Municipal Signal Association—Annual meeting, Providence-Biltmore Hotel, Providence, R. I., October 9-12. Irvin Schulsinger, secretary, 7 East 42 St., New York, N. Y.

National Electrical Contractors Association—Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., October 9-12. L. W. Davis, general manager, 420 Lexington Av., New York, N. Y.

American Institute of Electrical Engineers—Middle Eastern district, Scranton, Pa., October 11-13. H. H. Henline, national secretary, 33 West 39th St., New York, N. Y.

National Electrical Wholesalers Association—Semi-annual convention, Hotel Gibson, Cincinnati, Ohio, October 16-20. E. Donald Tolles, managing director, 165 Broadway, New York, N. Y.

National Safety Congress and Exposition—Atlantic City, N. J., October 16-20.

Empire State Gas & Electric Association—Annual convention, Westchester Country Club, Westchester, N. Y., October 19-20. George H. Smith, secretary, Grand Central Terminal, New York, N. Y.

National Electrical Manufacturers Association—Annual meeting, Palmer House, Chicago, Ill., October 23-27. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

Southeastern Electric Exchange—Fall conference, sales section, Henry Grady Hotel, Atlanta, Ga., November 2-4. J. W. Talley, executive secretary, 308 Haas-Howell Bldg., Atlanta.

Wisconsin Utilities Association—Electric section, commercial and technical divisions, Schroeder Hotel, Milwaukee, Wis., November 6-7. A. F. Herwig, executive secretary, Room 502, Brumder Bldg., 135 West Wells St., Milwaukee.

Brazos River Loan from RFC Pending

Application of the Brazos River Conservation and Reclamation District is pending with the Reconstruction Finance Corp. for a loan of $11,500,000 for flood control and electric power development on the Brazos River, Texas.

The proposed loan would be used for constructing a dam at De Cordova Bend, near Granbury, at a cost of $4,200,000; purchase and installation of power equipment at the Possum Kingdom Dam, near Mineral Wells, at a cost of $620,000; construction of power transmission lines connecting the Possum Kingdom generating plant with the De Cordova Bend plant, at a cost of $1,000,000; providing a reserve fund of $2,400,000 for co-operation with Federal or State governments in flood control, and $1,000,000 reserve for contingencies that might arise.

Officers of the district pointed out that there was pending with the PWA, when it ceased making allocations, an application for a loan and grant of $28,000,000 to construct several power and flood control projects on the river, including those proposed in the RFC application.

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Defer High Point Hearing

Judge J. H. Clement in Guilford County Superior Court, Greensboro, N. C., recently deferred until October 9 hearing on a motion by the city of High Point for authorization of certain specified expenditures in connection with the proposed municipal hydro-electric project. Attorneys for the city are asking for approximately $40,000, of which $33,000 was used for services rendered in June prior to the issuance by Judge H. Hoyle Sink of a blanket order restraining the city from proceeding with the project.

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Dunn Gets Hoover Medal

Gano Dunn, president of the J. G. White Engineering Corp., has been chosen as the 1939 recipient of the Hoover Medal, "awarded by engineers to a fellow engineer for distinguished public service," it is announced by John V. W. Reynders of New York, chairman of a board of award, representing the four national societies of electrical, civil, mining and metallurgical and mechanical engineers. The medal will be formally presented to Mr. Dunn under the auspices of the American Institute of Electrical Engineers during the annual convention in New York City January 22-26.

Output 15.5% More Than Last Year

Continuing the climb to new high levels the production of energy by the electric light and power industry during the week ended September 30 rose 0.8 per cent above that of the preceding week to 2,469,689,000 kw.-hr., according to the Edison Electric Institute.

The striking feature is not the rise itself—an upward trend is normal at this time of the year—but rather the growing excess over production in previous years. That margin now stands at 15.5 per cent over 1938 and 8.5 per cent above 1937, both figures being the largest thus far recorded in 1939. Production is already 7.7 per cent greater than at last December's peak, with the usual autumn and early winter rise still in prospect. The inference can scarcely be avoided that a rapid growth is taking place in the industrial load, although positive evidence will not be available until the monthly figures are announced, by classes of consumers.

To some extent the national percentage is affected by hurricane conditions in the East last year, as revealed by the abnormal increase in New England, but widening gains appear also in other sections, notably in the Rocky Mountain states where the jump to nearly 25 per cent would seem to reflect greater activity in the mining industry. In the Central Industrial region the excess of 17.9 per cent over 1938 is the largest thus far reported. The same holds true for the 14.7 per cent increase in the Middle Atlantic states.

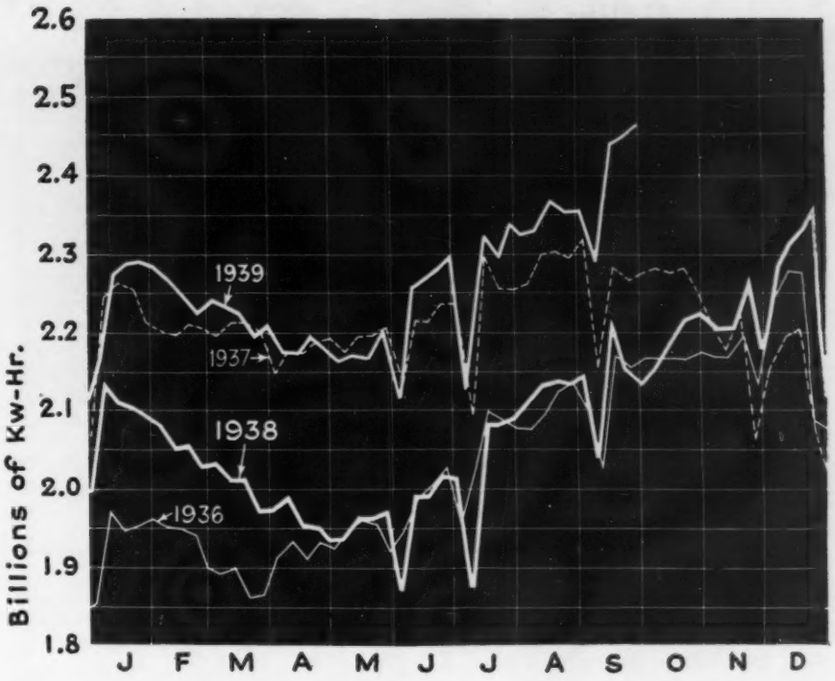
Weekly Output, Millions Kw.-Hr.

1939	1938	1937
Sept. 30...2,470	Oct. 1...2,139	Oct. 2...2,276
Sept. 23...2,449	Sept. 24...2,154	Sept. 25...2,266
Sept. 16...2,444	Sept. 17...2,215	Sept. 18...2,281
Sept. 9 .2,290	Sept. 10...2,048	Sept. 11...2,154
Sept. 2...2,357	Sept. 3...2,149	Sept. 4...2,321
Aug. 26...2,355	Aug. 27...2,134	Aug. 28...2,295

Per Cent Change from Previous Year

	Week Ending		
	Sept. 30	Sept. 23	Sept. 16
New England	*+30.5	*+37.9	+11.3
Middle Atlantic	+14.7	+ 7.5	+ 8.3
Central Industrial	+17.9	+15.8	+13.6
West Central	+ 8.4	+12.4	+ 9.4
Southern States	+12.6	+15.3	+11.1
Rocky Mountain	+24.9	+18.8	+14.6
Pacific	+ 5.9	+ 9.1	+ 5.6
United States	+15.5	+13.7	+10.4

*Reflects hurricane conditions in 1938.



August Output Hits New All-Time High

Production of energy for public use during August reached an all-time high of 11,051,357,000 kw-hr., 10 per cent more than in the corresponding month of 1938 and 5.5 per cent more than in July, according to the Federal Power Commission. Of the total, 31.7 per cent was produced by water power, as against 37.8 per cent a year ago and 32.9 per cent in July.

Capacity of generating plants reported as being in service at the end of August totaled 39,865,000 kw., which indicates an increase of 148,000 kw. over that previously reported in service at the end of July. It should be noted that capacity as announced by the FPC includes some plants that are not a part of the electric light and power industry, such as railway, together with manufacturing plants contributing to the public supply.

Utility power plants consumed approximately 4,026,783 tons of coal during the month. Consumption a year ago ago was 3,598,390 tons and in July, 1939, it was 3,700,702 tons.

Total stock of coal on hand September 1, 1939, was 8,706,414 tons. This was 5.8 per cent more than on August 1 and 5.0 per cent less than on September 1, 1938.

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July Sales Up 13.5% Revenue Rises 5.9%

Sales of energy to ultimate consumers continue to show pronounced gains compared with a year ago. They amounted in July to 8,583,052,000 kw.-hr., or 13.5 per cent more than the 7,562,210,000 kw.-hr. in July, 1938, and the corresponding revenue was $184,307,500 as against $173,984,700, an increase of 5.9 per cent, according to the Edison Electric Institute. Revenue from other sources added $2,292,700, making a total of $186,600,200 which was 6.0 per cent more than in the month of 1938.

Classification of Sales, July, 1939, and Increase Over 1938

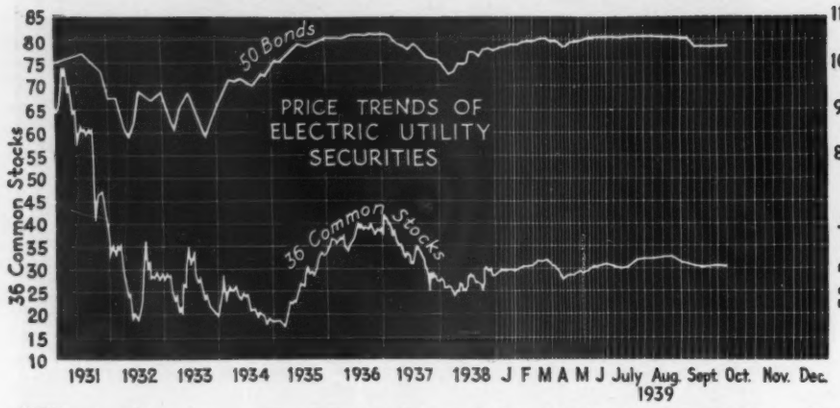
Class	Thous. Kw. Hr.	Per Cent
Residential or domestic	1,619,759	+ 7.4
Retail light, power	1,670,714	+10.9
Wholesale light, power	4,515,950	+19.2
Public lighting	115,333	+ 3.4
Other public authorities	196,756	— 5.0
Electric railways	289,716	— 1.7
Electrified railroads	142,927	+23.9
Interdepartmental	31,897	+ 0.3
Sales, ult. consumers	8,583,052	+13.5

For comparison, the energy sales in June were 8,577,121,000 kw.-hr. and the revenue from consumers was $184,231,200, representing gains of 15.3 and 6.9 per cent, respectively, over 1938.

As in the preceding month the most important increase occurred in the wholesale group, where it amounted to 19.2 per cent. The growth in energy sold to electrified railroads was larger proportionately, 23.9 per cent, but the item is only 1.6 per cent of the total, whereas wholesale power and light constitutes 52.5 per cent of total sales to consumers.

Production rose 10.7 per cent, compared with last year, to 10,000,137,000 kw.-hr., of which 6,928,300,000 kw.-hr. came from fuels, up 22.6 per cent, and 3,071,837,000 kw.-hr. from water power, down 9.3 per cent and comprising only 30.7 per cent of the total. Purchases from other sources and net international imports brought the total input up to 10,423,052,000 kw.-hr.

Utility Securities Continue Rise


50 Bonds
PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
1931 1932 1933 1934 1935 1936 1937 1938 J F M A M J July Aug. Sept. Oct. Nov. Dec. 1939

Utility security prices continued their advance during the first week in October. The "Electrical World" stock index moved upward to 30.9 from 30.7 in the preceding week; last year, 27.0. "Electrical World" bond index, 104.3, last week, 103.8.

Files Plan of Stock Offering with SEC

North American Light & Power Co. has filed with the Securities & Exchange Commission a declaration covering the proposed issuance and sale of 2,666,667 shares of $1 par value common stock. It is proposed to offer 2,000,000 shares of the stock pro rata to common stockholders of record March 5, 1935, at $1 a share, and the balance will be offered pro rata to common stockholders of record March 5, 1936, at $3 a share.

The declaration states that the North American Co., the parent, proposes to waive its rights in the offerings to the extent necessary to permit the offering to be made to other common stockholders but, in accordance with a decision of the U. S. Circuit Court of Appeals for the second circuit, in August, 1939, will take up all shares not subscribed by other common stockholders.

Entire net proceeds from the sale of the stock are to be devoted to the retirement of the company's promissory notes amounting to $4,000,000 held by the parent company.

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Associated Gas Plans Sale of Properties

Associated Gas & Electric System has outlined to the Securities and Exchange Commission a report setting forth the steps that have been taken to meet the general objectives of the tentative plan of integration and simplification of the system.

A $50,000,000 financing program of the NY PA NJ Utilities Co., largest intermediary holding unit in the system, is proposed as part of the plan. It is also proposed to acquire complete control of Jersey Central Power & Light Co.; the sale of properties in Florida, Georgia, South Carolina, Ohio, Indiana and Connecticut; dissolution of the York Railways Co., and the rearrangement of the properties in New York State.

Upon completion of the proposed plan, Associated Gas would confine its operations primarily to New York, Pennsylvania and New Jersey.

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$6,700,000 Issue Placed by Utility

Northwestern Electric Co., Portland, Ore., has filed with the Securities and Exchange Commission an application for exemption from the Holding Company Act's requirement for filing a declaration, respecting the issuance and sale of $6,700,000 of first mortgage 4 per cent bonds, 1969 series, and $2,800,000 of 4½ per cent debentures, due in 1959, to be sold privately. The bonds will be sold to insurance companies, according to the application.

Net proceeds are to be used to redeem certain outstanding bonds of the company, to discharge certain indebtedness to American Power & Light Co., parent company, and to reimburse the company's treasury in part for expenditures previously made for extensions and improvements to its facilities.

Minnesota Utilities Co., Savanna, Ill., has filed a declaration, covering the issuance and sale of $80,000 of 6 per cent promissory notes. The notes are to be sold to American Utilities Service Corp., the parent company, for cash. Proceeds are to be used to retire $80,000 of Root River Power & Light Co.'s first mortgage 15-year 6 per cent gold bonds, due October 1, 1941.

SEC has announced that Caribou Water, Light & Power Co. has filed an application for exemption from the requirement of filing a declaration in connection with the issuance and sale of $275,000 of its first mortgage 3½ per cent bonds, Series A, and the issuance of 563 shares of $100 par value common stock. Bonds are to be sold privately to the John Hancock Mutual Life Insurance Co. The common stock is to be issued as a stock dividend. Proceeds from the sale of the bonds will be used to retire at par presently outstanding obligations consisting of $155,000 of first mortgage 6 per cent gold bonds and a 7 per cent demand promissory note in the principal amount of $120,000.

SEC has extended the time in which the United Corp. may carry out an investment program involving $8,000,000 of funds which would be used to purchase securities of non-utility companies. A four-month extension was granted.

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Colorado Springs Retires Last of Utility System Debt

The $4,000,000 municipally owned gas and electric system of Colorado Springs will be free of debt when it retires $181,000 of gas bonds on October 1. Last July 1 the city retired $118,000 in bonds on the electric system.

Since Colorado Springs purchased the combined utilities from its private owners in 1926 the city has retired $2,200,000 in bonds, of which $1,600,000 were against the electric system. Throughout the thirteen years the system has paid the city a yearly operating revenue in lieu of the taxes a private system would pay. In 1938 these contributions totaled $180,000, or approximately 28 per cent of the city's revenue from all sources.

•

Calls $200,000 Bonds

Bankers Trust Co., as trustee, has called by lot for redemption on November 1, 1939, for sinking fund purposes, $200,000 principal amount of Connecticut Light & Power Co. first and refunding mortgage 7 per cent sinking fund bonds, series A, at 106.

Utility Reports

	Net Income 1939	1938
*Commonwealth & Southern and subs.	$13,034,924	$10,493,973
*Dallas Pwr. & Lt.	1,604,746	1,612,589
†El Paso Electric (Tex.)	361,538	340,941
*Houston Ltg. & Pwr.	2,853,802	2,915,915
*Kansas Gas & Elec.	1,169,564	1,301,964
*Louisville Gas & Elec. (Ky.) and subs.	2,751,985	2,697,485
*National Pwr. & Lt. and subs.	7,782,469	8,588,233
*Nebraska Power	1,882,627	1,885,720
*Northwestern Electric	550,322	473,466
*Pacific Power & Lt.	951,074	800,805
*Texas Power & Lt.	2,131,090	2,151,039
*Utah Power & Lt. and subs.	1,639,443	1,354,606
*Washington Water Power and subs.	2,920,559	2,347,831

*Twelve months ended August 31.
†Twelve months ended July 31.

Any ONE of These 3 Savings

May Justify Your Selection of G-E Unit Substations

1 INSTALLATION SAVINGS

You eliminate the conventional substation structure and the assembling of many parts bought separately — G-E unit substations are shipped assembled. The time required for installation is a matter of hours instead of days. Simply set the units in place and make connections.

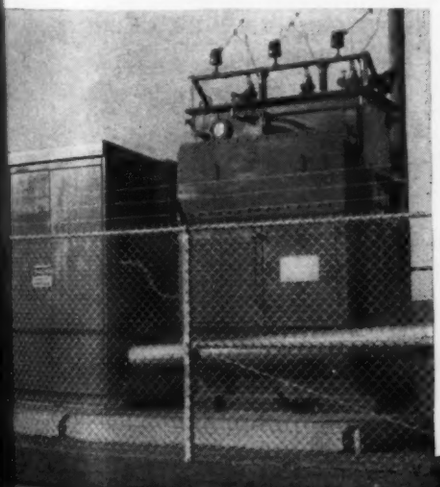
2 SYSTEM INVESTMENT

Unit substations make it possible to add capacity in small blocks as needed—thus avoiding large investments in equipment that may not be fully utilized for years, if at all. This feature does away with the possibility of loss due to obsolescence resulting from changing load conditions; unit substations can be moved readily to new locations. Salvage value is practically 100 per cent.

3 REAL ESTATE

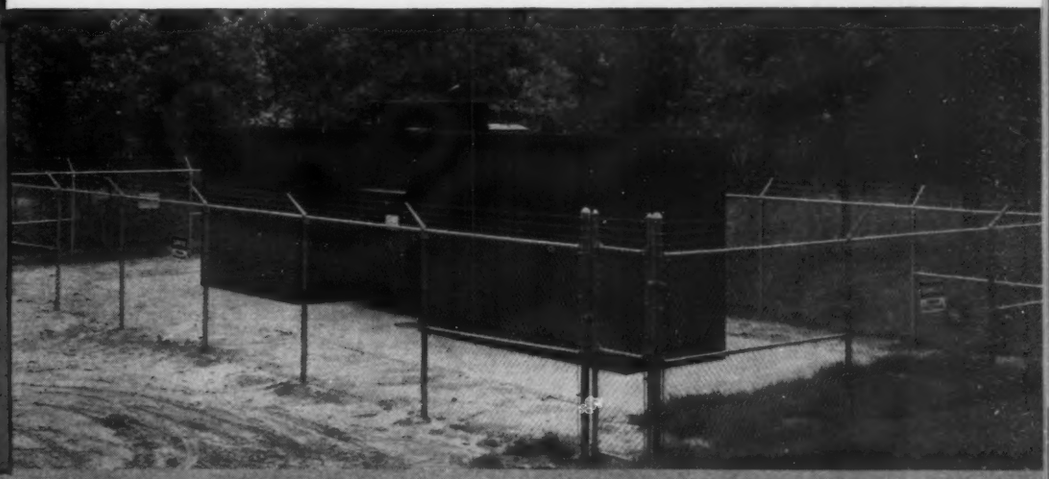
You save in real estate and taxes because the unit substation is compact and self-contained. It requires little space and no building. Small plots of ground are easier to obtain and less costly than the larger plots required by conventional substations.

Any one of these three savings may justify the selection of G-E unit substations for distribution requirements. Together, they afford an unusual opportunity for economy. Ask your G-E representative for complete information. General Electric Co., Schenectady, N. Y.



▲ Like the larger G-E unit substations, this single-circuit unit substation offers economies in time and over-all costs. This unit includes: a three-phase transformer with automatic voltage-changing equipment; a low-voltage automatic reclosing circuit breaker with isolating and by-pass disconnecting switches; lightning arresters; and metering equipment

Attractive appearance is *another* feature ▶ of G-E unit substations. This typical substation is rated 3,000 kva, with breakers for both 13,200 volts and 4,000 volts. It is in service on the lines of the Public Service Company of Oklahoma, at Tulsa



GENERAL ELECTRIC

310-33

OPERATING PRACTICES

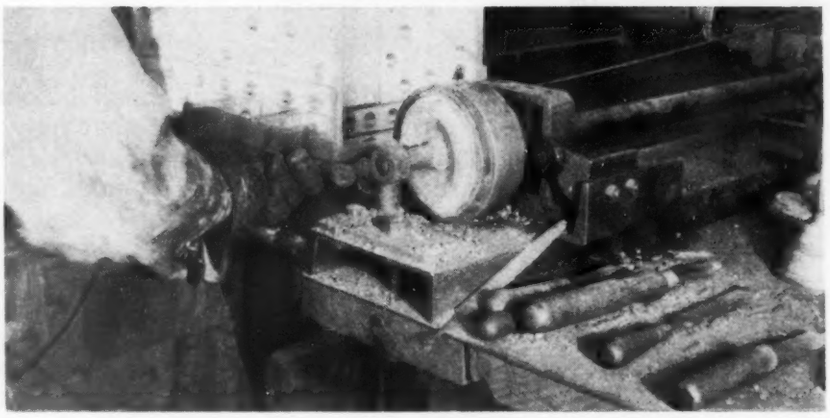
Soil-Heating Cable Avoids Ice Hazard

Danger of rainspouts, heavy with ice, breaking loose from the Page Avenue station of the Union Electric Company, St. Louis, Mo., and falling into adjacent 33-kv. transformers and switchgear has been avoided by the installation of 120 ft. of soil-heating cable in the downspouts to keep them free of ice.

Large quantities of rock salt have been used in the past to prevent freezing, but this method was crude and not always effective. The soil-heating cable offers a more practical solution to the problem.

To obtain a heat radiation of about 800 watts, 120 ft. of cable was installed in each 60-ft. downspout. A thermostat similar to those used for home heat control was recalibrated to close contacts of an auxiliary relay controlling supply to the heating elements when the temperature reached 34 deg. and to open at 35 deg.

The cable is supplied at 250 volts from a circuit supported on secondary racks attached to the inside of the roof coping. The installation cost less than $25 per downspout and has eliminated a potential source of short circuits which would prove dangerous and expensive.



Boiler handhole cover being cleaned by a special machine constructed for the purpose at Southern California Edison's Long Beach steam plant

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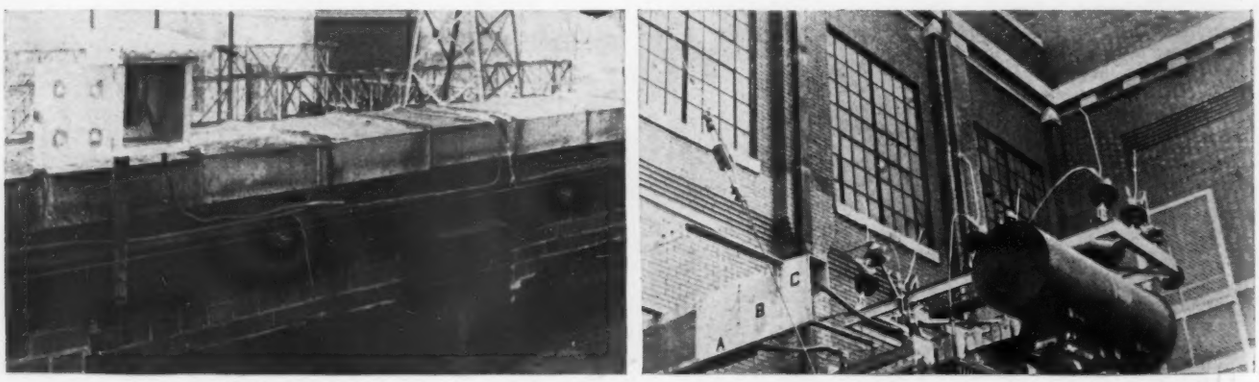
Cap-Cleaning Device Aids Boiler Upkeep

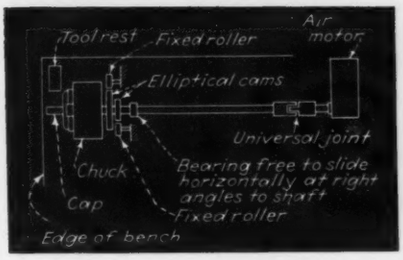
A very simple device for removing old asbestos gaskets from boiler handhole covers which have been taken off during boiler overhaul has been designed and built at Long Beach steam plant of Southern California Edison Co. It enables one man to clean at least 150 covers per day with ease, whereas the hand work was a tiring job which yielded only 40 clean covers in a working day.

What the device does is to rotate and oscillate the elliptical cover in such a way that a hand tool can be held in a fixed position to scrape off what remains of the old gasket.

The cover plate is held in a chuck having two stationary and one spring-loaded jaw. The chuck is mounted on one end of a 3-ft. shaft, the other



Soil-heating cable (left) keeps rainspout from freezing, breaking loose and falling into 33-kv. substation equipment (right)



Schematic plan-view sketch of the device

end of which connects through a universal joint to the power source. This consists of a portable air drill, operated at reduced pressure and controlled by a foot pedal.

Two elliptical cams, mounted just behind the chuck with their long axes at 90 deg. to each other, originate the oscillating motion. Each cam bears against a fixed roller. The shaft bearing, mounted just behind the cams, is allowed to slide horizontally, but is restrained from moving vertically.

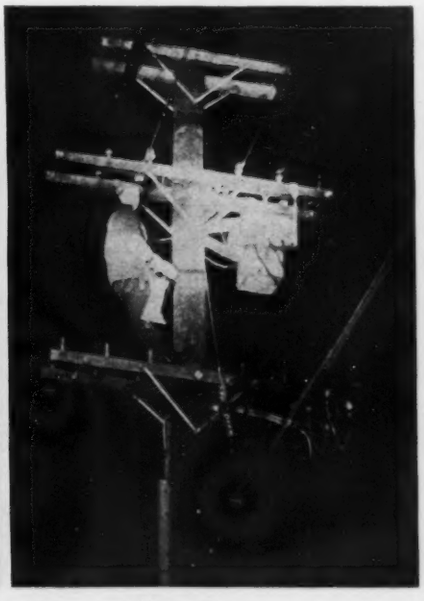
The whole device is mounted on a work bench, a piece of channel iron constituting the base. To this is mounted a tool rest, which the workman employs in the same manner he would one on a wood lathe. Because the gasket material rapidly wears away the ordinary tool edge, those used are faced with stellite.

Inasmuch as one boiler at the Long Beach plant has 3,200 handholes and as the normal maintenance schedule involves overhauling three such boilers in a year, the device represents substantial economies, as well as making it possible for a man to clean a batch of covers during a period when work is slack.

•

Turn Night Into Day at the Crossarm

Night maintenance has been speeded up and service interruptions reduced in duration on the system of the Public Service Company of New Hampshire by substituting an intensive-beam type of portable floodlight for the ordinary dry cell type of flashlight previously carried by linemen. The company now uses approximately 200 of these units, divided between portable outfits and equipment of the same general character attached to line trucks. A 6-volt, double filament lamp of special design is used with silvered parabolic reflector, and rechargeable batteries are used on the portable sets. These floods weigh approximately 9 pounds each and need not be taken up the pole for proper lighting of a repair job. A luminous area 10 ft. in diameter is provided at the top of the 50-ft. pole shown in the illustration, and the intensity of the beam is sufficient to enable a newspaper to be read at night a mile or more distant from the floodlamp. The floods speed up the discovery and location of wire and insulator troubles and the portable units facilitate picking up trouble from off the right-of-way in locations where truck movement or patrol on foot is impossible or difficult. These units were made by the Carpenter Manufacturing Company, Cambridge, Mass., and the recharging batteries, with intelligent care, have an expected life of three to four years.



Searchlight at or near ground level covers crossarm working area
Joint pole line illuminated by searchlamp about 40 ft. below crossarm

•

Derrick Increases Usefulness of Truck

To increase the usefulness of a 2-ton truck operated in underground system maintenance by the Narragansett Electric Company, Providence, R. I., a special derrick was built by the company having a lifting capacity of 3,000 lb. and designed for operation by the truck engine and connected winch. Transformers up to 50 kva. rating are easily handled and swung through any usual angle in entering or leaving manholes. Seventy feet of wire rope are provided and in essentials the derrick consists of a pair of sheaves mounted in a horizontal arm 3 ft. long and about 9 ft. 6 in. above the street surface, the arm rotating in a column on roller bearings, which is fastened to the truck frame at its rear end. The column is of steel, 5 in. in diameter.

•

Adjusting 3-Range D.C. Ammeters

By ARTHUR W. WEEKS
Boston Edison Laboratory

Three-range direct-current ammeters and milliammeters are difficult to adjust to scale unless the original resistance values of the various parts of the instrument circuit are known. Should the instrument be burned out, the usual method is to attempt adjustment by the "cut-and-try" method,

Yes, we've streamlined the finest generator-voltage regulators G.E. ever built

WHEN a product is fundamentally correct in principle, and when it has an outstanding service record of more than five years on thousands of machines throughout the country, it's a pretty difficult job to improve its design and performance. Yet that is just what General Electric engineers have done with the now popular Type GDA direct-acting generator-voltage regulator. They have not only improved its appearance, but in improving it they have eliminated a few moving parts, made the remainder stronger and lighter, and thus obtained even better performance than that of the previous design. The new design is fully enclosed to prevent the entrance of dust and dirt, and it makes a good appearance on any switchboard.

DIACTOR is the name we've given this new design—because it's direct acting—because it's of the rheostatic type—and because it's different from any other. For further details, see the next page.

GENERAL ELECTRIC

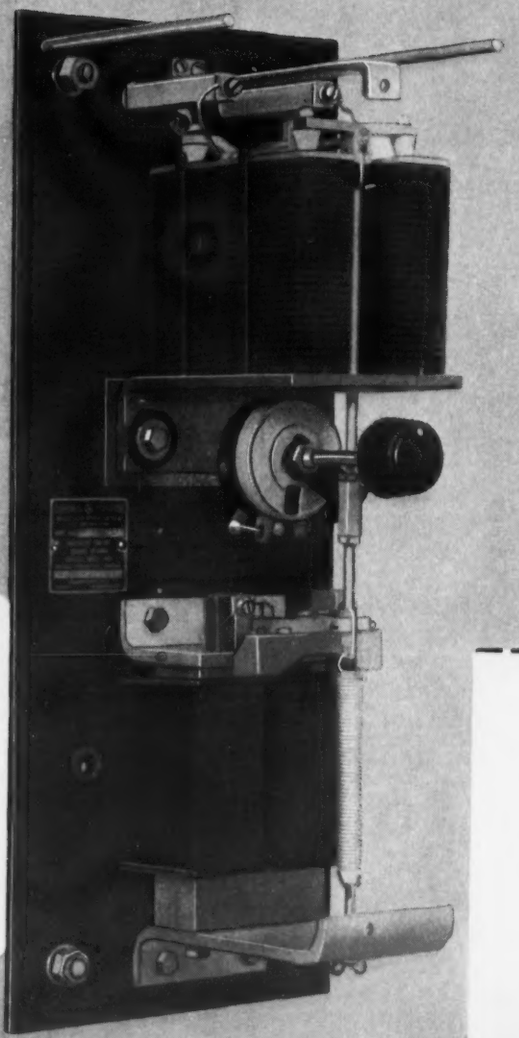
AND HERE ARE 4 REASONS WHY YOU GET MORE FOR YOUR MONEY THAN EVER BEFORE

A COMPLETE LINE

G-E DIACTOR regulators are available in six different ratings for generators rated 15,000 kw (3600 rpm), and smaller machines at correspondingly lower speeds. The smallest and newest of the regulators is designed for generators up to 25 kw.

AS LOW AS $70, List

New rating, Type GDA-29, for machines up to 25 kw



1. We've made no changes in the rheostatic element, because after five years of service on thousands of machines it still remains the best quick-action, wide-range element we know how to build. It's the only element that provides an infinite number of smooth resistance steps from practically zero to the maximum.

2. The torque element has been improved by the elimination of all pivots and bearings. A self-aligning spring suspension precludes all maintenance at this point.

3. Greatly reduced weight of the torque armature assembly has cut down the inertia so that the regulation curve is smoother than ever before.

4. The enclosing case prevents the entrance of dust or dirt and improves the appearance of the switchboard.

MAY WE SEND YOU COMPLETE INFORMATION?

General Electric
Schenectady, N. Y.

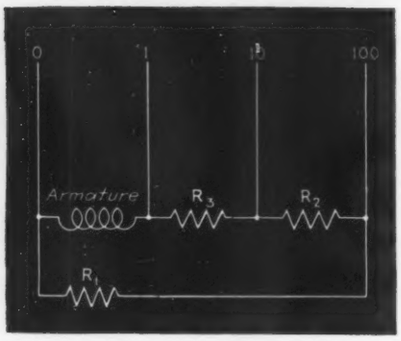
Please send me a complete description of the new line of DIACTOR generator-voltage regulators (GEA-2022C).

Name.....

Company.....

Address.....

GBD-16



Circuit diagram for three-range ammeter

which usually results in obtaining accuracy for one range and large scale errors for the two others.

The following procedure will greatly facilitate accurate adjustment of all three scales. The diagram shows the internal connections for the instrument with the four necessary connections brought to external binding posts. Assumed scale is 1, 10 and 100. but the formulas can be worked out for any scale.

Resistances R_1 R_2 and R_3 in series constitute a shunt around the armature which should be adjusted to such a value as will cause the instrument to read correctly on the low scale. Then, if Rx equals the shunt resistance—*i.e.*, $Rx = R_1 + R_2 + R_3$— each resistance should be adjusted to satisfy the following equations:

$$R_1 = 1/100\ Rx$$
$$R_2 = 9/100\ Rx$$
$$R_3 = 9/10\ Rx$$

The total resistance has been maintained, for the sum of $R_1 + R_2 + R_3$ still equals Rx, and the division of current for the three ranges will be correct.

•

Remedy for Leads Siphoning Oil

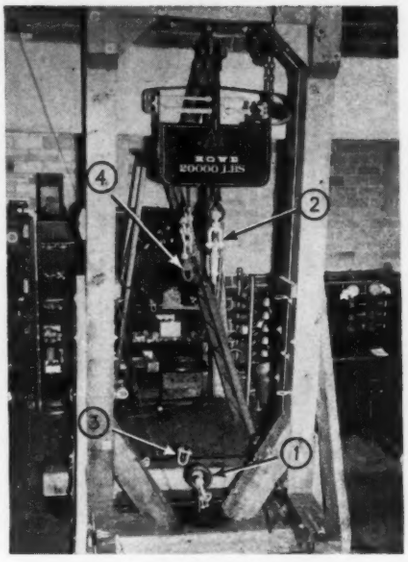
High-voltage transformers present difficulties when their leads begin to siphon oil. In order to stop the leads from siphoning oil the insulation must be cut back from the conductor above the oil line. This is done to stop capillary action of the insulation and also make the conductor accessible. The conductor is usually stranded wire, itself a siphoning medium, which, for 2,300-volt transformer leads, may be heavily tinned so that it becomes a solid wire or a clamp used when the lead is in an inaccessible place. But, as described in Alabama Power Company's "Powergrams," for 11,000-volt or 6,900-volt transformers, there is not enough clearance between conductor and transformer case after the insulation has been removed.

After the necessary steps have been taken to stop the siphoning, a piece of fibre tube at least $\frac{3}{16}$ in. thick should be cut to fit the space where the insulation has been removed, the tube is split to fit into place around the conductor and then cord or tape is used to hold the tube in place. Use of too much tape must be avoided or the leads will start siphoning oil again.

Insulator Loading Frame

For testing high-voltage suspension insulator strings under mechanical load, engineers of the Central Illinois Public Service Company have built this lever beam loading frame which is used in the company's high-voltage laboratory. The insulator string to be tested is mounted between the eye-bolt (1) and scale (2) and loaded by taking up a heavy-duty turnbuckle attached between points (3) and (4). The amount of the total tension on the string is indicated on the scale at the end of the lever beam.

Side columns of the frame consist of two 7 x 7-in. oak timbers. Top and bottom beams consist of four $3\frac{5}{8}$ x 10 in. set on edge. Distance between beams inside is 11 ft. and between columns 4 ft. Steel bearing plates through which the top and bottom eye-bolts pass are 18 in. square and $1\frac{3}{4}$ in. thick.



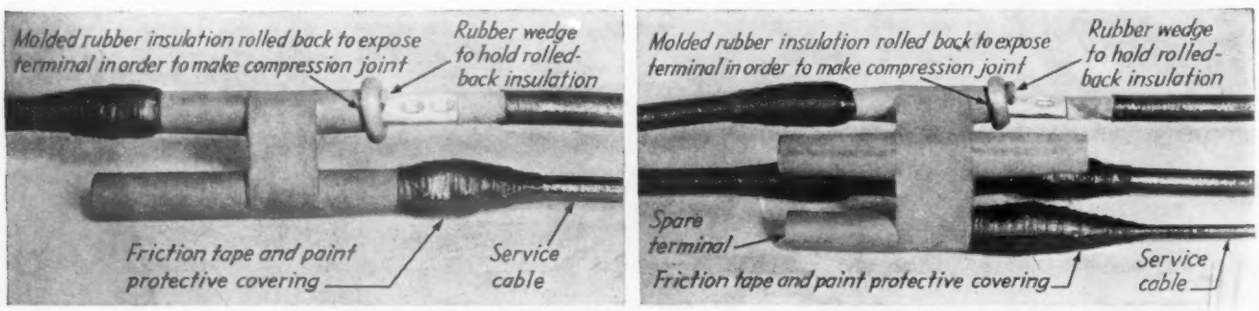
Roll-Back Insulation on Crab Joints

By C. P. XENIS and E. WILLIAMS
Consolidated Edison Company of New York, Inc.

Non-fusible crab joints are used at intermediate service boxes on the secondary distribution networks of the Consolidated Edison Company of New York, Inc. A roll-back feature incorporated in the rubber insulation on these joints has reduced to a minimum the amount of taping.

It permits the rubber insulation to be rolled back temporarily when joining the cables to the crab joint. After the compression joint has been made the rubber is unrolled to cover the tubular terminal and the required amount of rubber tape is then applied to complete the joint.

Due to space limitations, this roll-back feature has not been incorporated in the company's fusible crab joints (see page 46); it is used on the non-fusible crab joints for both the 500,000-circ. mil. system (left) and the twin No. 4/0 system (right).


Molded rubber insulation rolled back to expose terminal in order to make compression joint
Rubber wedge to hold rolled-back insulation
Friction tape and paint protective covering
Service cable
Molded rubber insulation rolled back to expose terminal in order to make compression joint
Rubber wedge to hold rolled-back insulation
Spare terminal
Friction tape and paint protective covering
Service cable

Roll-back feature on rubber insulation of non-fusible crab joints reduces taping to a minimum

STATEMENT OF POLICY

The world is entering a crisis, the result of which no one can foresee. Other wars have brought inflation, followed by unemployment and depression after peace was achieved. America's experience in the World War illustrates this fact.

Much of this post-war trouble would have been eliminated by a more foresighted price policy on the part of manufacturers and distributors. Price inflation by the seller when he had a dominant position resulted inevitably in reaction with deflation, depression and suffering. Many of those price increases were not warranted.

Before such an inflationary cycle of prices is again started, we publicly pledge ourselves, as far as possible, to maintain present prices.

Further, if the materials we buy are increased in price, or the cost of labor is increased, then we pledge ourselves to raise selling prices no more than the bare increase in cost of raw materials and labor going into our products.

Further, we pledge ourselves to pass on to our customers the reduction in cost made possible by better manufacturing methods, wider distribution and technical advances in production.

THE LINCOLN ELECTRIC COMPANY

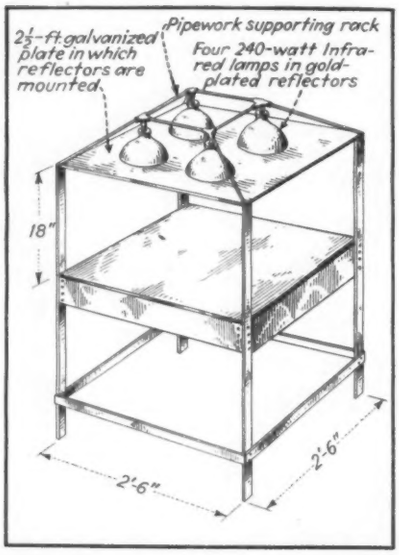
Cleveland, Ohio
October 2, 1939

J. F. Lincoln
President

INDUSTRIAL ENGINEERING

Infra-Red Heat Speeds Paper Drying

Before the Statter Wall Paper Company tried using radiant heat at its Crystal Lake, Ill., plant it took about fourteen minutes to dry a production sample of wall paper to the point where a reliable check could be made on the final colors of the paper. Presence of volatile oils in the "wet" paper as taken from the press made colors appear three to five times richer than when the paper was dried. In these fourteen minutes considerable paper was wasted if the colors, upon drying, proved to be the wrong shade. Similarly if the press was stopped to avoid this waste considerable production time was lost, especially when a number of checks were made during a run.



Dry color test sample of wall paper under infra-red lamps in one minute and save thirteen minutes of press time

Four 240-watt infra-red lamps in gold-plated reflectors, arranged as shown in the accompanying sketch 18 in. above a small drying table, now dry a sizable sample of paper in 1 to 1½ minutes and allow a reliable color check to be made quickly under fluorescent light without either stopping the press or wasting more paper than is necessary, if the color is slightly off.

•

Novel Signal System for Belt Conveyors

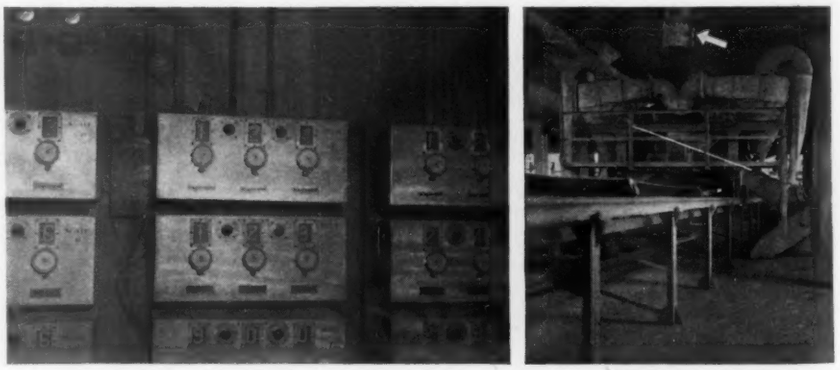
By C. C. HERMANN
Philadelphia, Pa.

An electric signal system for belt conveyors at the Port Richmond, Philadelphia, Pa., grain elevator avoids mixing of grains in the bins. This elevator has 297 grain bins with a total capacity of nearly 3,000,000 bushels, two car dumpers capable of dumping 6,000 bushels per minute, three 48-in. and one 36-in. receiving belts with a combined capacity of 90,000 bushels per hour and twelve 36-in. shipping belts with a combined capacity of 180,000 bushels per hour.

All of the dispatching is done by the head weigh-master, located on the scale floor in the work-house section of the elevator. In his office are a series of push buttons, with a number above each button. A similar bank of buttons and numbers is located in the bin-master's office, which is above the bins in another section of the elevator. Out on the bin floor and above the bins is a signal indicator and lamp mounted just above the tripper mechanism.

From his records and from the verified information sent him by the dumping office the weigh-master determines into which bin the grain coming over a given belt is to go. On the signal board he pushes the buttons corresponding to the bin number into which the grain is to be sent. The numbers thus selected appear on the board in the bin-master's office and also light up out on the bin floor directly over the bin into which the grain is dispatched.

To make sure that he has received



Numbers above push buttons on despatching board (left) correspond to number of bin into which grain being carried along on a belt conveyor is to be dumped. Pressing the buttons also lights up signal indicator and lamp above tripper mechanism (right)

the right bin number, the bin-master sends the number back to the weigh-master over the system installed in his office. This number is recorded on an indicator in the weigh-master's office; if correct, the weigh-master signals his O.K. by a light flasher.

The indicators used are essentially single-phase, wound-rotor induction motors. Two of these motors are connected to the same single-phase circuit with the secondaries electrically connected so that both rotors will maintain the same position with respect to the stators. In such a system, if one rotor is moved by an external source of energy, an emf is produced causing current to flow through the secondary circuit to the second motor, some distance away. The second rotor then moves to the same position with respect to the stator as the first motor. Since the motors are identical, either may be used as sender or receiver, making it unnecessary to have a duplicate set installed to check the signals and instructions.

John A. Behl, electrical engineer for the elevator, who worked out the system, reports that it has never failed during the ten years it has been in operation.

•

Liquids and Solids WeighedAutomatically

Both liquid and solid ingredients that go into Italian Balm, Dreskin and other products made by the Campana Corporation at its Batavia, Ill., plant are weighed automatically on photo-electrically controlled scales, which in some instances are sensitive to 1/100 of an ounce and capable of weighing the exact amount of material to within 1/50 of 1 per cent. Typical liquid and solid weighing scales are shown in the accompanying illustration.

As the fluid flows into a tank on the platform of the automatic liquid-weighing scale a flag attached to the pointer sweeps over the weight dial until, as the desired weight is approached, its leading edge intercepts a narrow beam of light directed on a photo-tube. The impulse from the photo-tube trips a relay that closes the main solenoid-operated valve and opens a trickle valve, allowing only a thin stream to pass into the container. The trickle continues until the trailing edge of the point or flag again uncovers the photo-tube actuating controls that close this valve firmly and opens a discharge valve to drain the tank into a waiting container.

The arrangement for weighing solids is essentially the same as that for weighing liquids. Solids from a hopper are slowly shaken from an electrically vibrated chute into a container on the scale platform. As the pointer flag intercepts the light beam vibrations are slowed and finally stopped as the trailing edge uncovers the photo-tube. A chute leading from the container on the scale platform is automatically operated and the solid vibrated into the waiting batch tank. A propeller-type agitator mounted on the batch tank stirs the mixture as the solid is added.

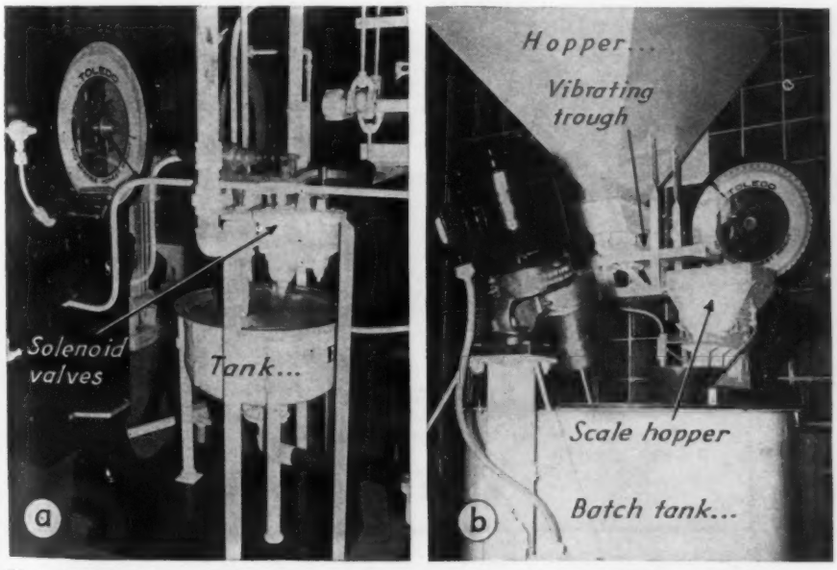
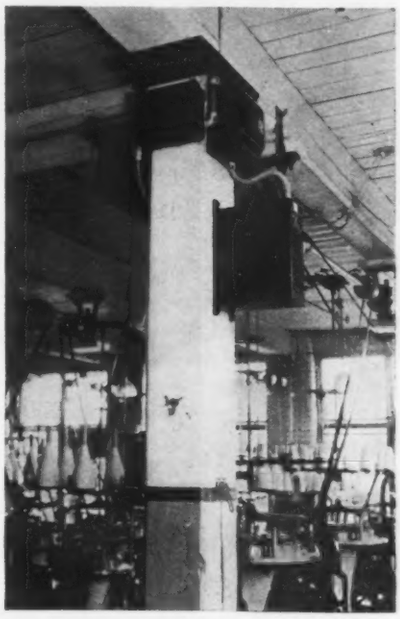


Photo-electrically controlled scales weigh liquids and solids to 1/100 of an ounce
(a) Liquid weighing scale. (b) Solid weighing scale.

Initial Capacitor Layout Facilitates Production

Earnshaw Knitting Company, Newton, Mass., operates about 60 550-volt motors ranging from 2 to 15 hp. in rating and 36 $\frac{1}{3}$-hp. motors, all the above being three-phase inductions, formerly giving a plant power factor of the order of 73 per cent.



5-kva. capacitor units at feeder ends serve motor groups

This has been raised to about 81 per cent under full-load conditions by the installation of five 5-kva. Dubilier capacitors, four being at the ends of the power circuits feeding the integral hp. motors and the fifth near the substation 550-volt bus. The connected load is approximately 300 hp. in motors and there is a winter lighting load of about 15 kw. The demand ranges from about 92 kw. in summer to about 120 kw. in winter under conditions of maximum production.

The capacitors are mounted in units on the building columns and connected across the line with disconnecting switches and terminal boxes wired with flexible and rigid conduit as shown, well out of the way of manufacturing areas. Additional units can easily be installed if conditions require their use. Voltage regulation at the integral hp. motors has been improved about 5 per cent and the installation should pay for itself in five years.

NEW ENGINEERING IDEAS

New Air Breaker Has Novel Chute Design

By L. S. HOBSON
General Electric Company

An entirely new design of arc chute makes for compactness in this new high-voltage air circuit breaker designated as the "Magne-Blast." Of medium interrupting capacity, it has the same application and is about the same size as an oil circuit breaker of equivalent rating; positions of the solenoid and bushings are the same as in an oil breaker.

During interruption the arc is drawn by the opening of the arcing contacts across the throat of the chute. Two magnetic blow-out coils on the top arc runner and one on the lower arc runner force the arc into the chute. As the arc proceeds into the chute the hot gases are thrown into immediate contact with interleaving fins of increasing area which rapidly dissipate the heat from the arc. This lengthening and cooling of the arc gases, in turn, rapidly increase the arc resistance. This high resistance is responsible for the breaker performance in that:

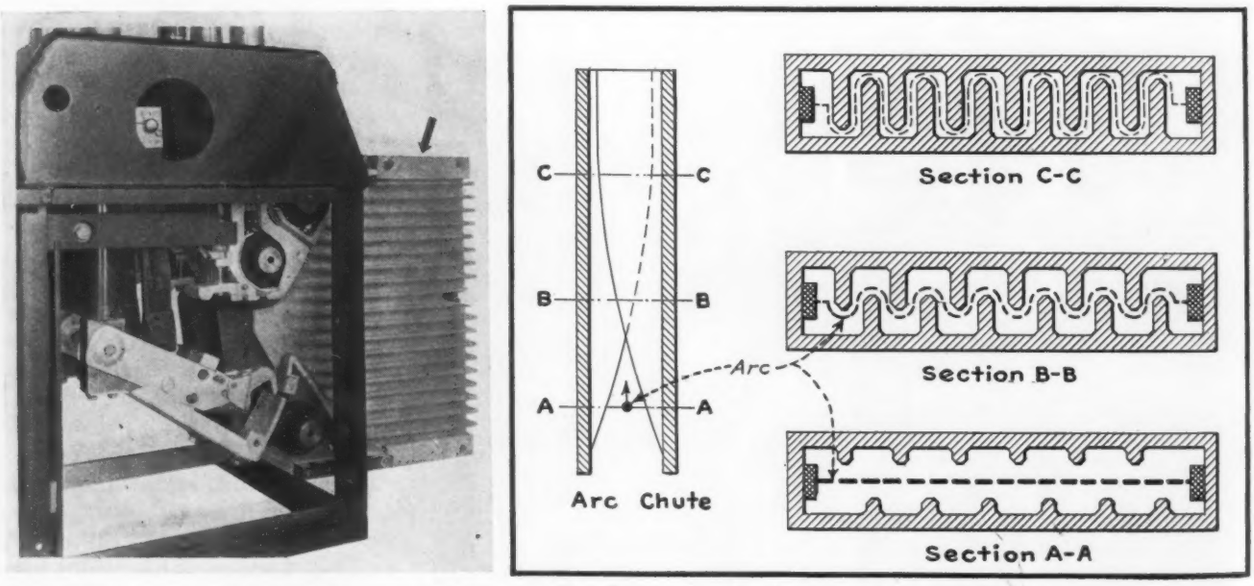
1. It reduces the magnitude of the current in the arc to a marked degree.
2. It increases the power factor of the circuit and reduces the rate of rise of recovery voltage.
3. At an early current zero the resistance is so high that the lowered recovery voltage cannot support the arc and the circuit is interrupted.

The operating characteristics, therefore, permit this breaker to interrupt with ease any circuit within its rating, regardless of the severity of the recovery voltage characteristics of the particular circuit. It also reduces the deterioration on the contact parts to a very small amount.

"Sixty-Line" Contacts Aid Switch Operation

A novel arrangement of minute "sled runners" which slide on the break jaw of a Westinghouse indoor disconnecting switch gives blade contact along 60 lines instead of one. The line contacts, covering two rectangular areas about $\frac{1}{2}$ in. wide by $\frac{3}{4}$ in. long on each of two parallel blades, resemble coarse screw threads and are coated with silver, hardened by a special process to increase its resistance to wear. The short lines parallel to the direction of motion combined with the open spaces between lines insure complete self-cleaning of the contacts at each operation.

Even though the switch may have been closed a long time, blade operation is easy because of the short path



New design of arc chute makes for compactness in high-voltage air circuit breaker

Projecting fins (arrow) interleave with corresponding number of fins on the other half of the arc chute which has been removed. As the arc progresses further it is squeezed and lengthened (right) in such a manner as to form a serpentine path across the chute.

7 Reasons for Specifying KEARNEY Con-nec-tites

1 Wire sizes are clearly stamped on the heads of Con-Nec-Tites.

2 Hexagonal head fits securely into wrench and permits positive tightening.

3 Uniform slot widths are accurately checked to within limits of 3/1000ths of an inch.

4 Maximum pressure between conductors is obtained by clean threads and use of full-round washer.

5 Patented Full-Round Washer affords a smooth, low-friction bearing surface for the nut.

6 Uniform threads provide easy nut engagement; minimize nut friction and transmit most of exerted torque into direct pressure between conductors.

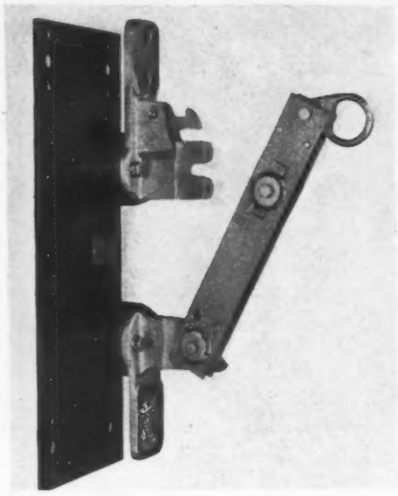
7 A thread "lead pilot" permits easy starting of nut onto bolt.

THERE ARE MORE THAN 75 STANDARD CON-NEC-TITES

For Better Maintenance and Construction—

Use KEARNEY PRODUCTS

MADE BY THE JAMES R. KEARNEY CORPORATION
4224 CLAYTON AVE., ST. LOUIS, MO., *Canadian Office:* TORONTO, ONTARIO, CANADA



Multiple line switches are rated at 200-6,000 amp. for 5,000 volts, 400-6,000 amp. for voltage range of 7,500-34,500

of contact and because the operating eye and blade lath are designed to produce cam or pry-out action, which completely disengages the blades from the tongue member. Contact pressure is adjusted at the factory and is maintained by a resilient spring cup washer at each end of a bolt which passes through both blades, between the line-contact areas.

In case of short-circuit current, the magnetic force tends to pull the two blades together, thus increasing the contact pressure and minimizing the chance of damage to the contact by arcing.

•

Strength, Capacity in New Bus Design

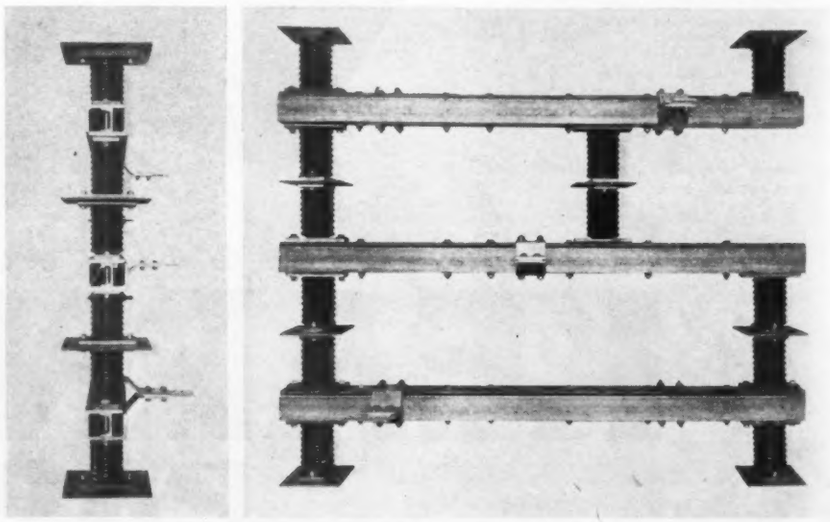
By B. SCHRAGER
Public Utility Engineering & Service Corporation, Chicago

Recognition and separation from each other of the mechanical and electrical functions of heavy current buses has led to a new form of bus structural design that offers important features of economy in first cost and in erection. The new type of bus, developed jointly by F. W. Fromm and the writer and which has been installed in the Riverside generating station of the Northern States Power Company, consists of a structural member designed for the mechanical stresses that may be imposed on it and a conductor member or members calculated according to the desired current-carrying capacity.

The assembly of mechanical and electrical members of the bus may take many different forms, but the design used in the Riverside station appears to be about the simplest and best from all viewpoints. As appears in the accompanying illustrations, the mechanical member is a channel of structural aluminum alloy to the flanges of which are bolted the electrical members, two angles of pure aluminum arranged to form a hollow square section. The diagonally opposite longitudinal open slits between the edges of the two angles allow a certain amount of air circulation inside the bus and thus facilitate the dissipation of heat.

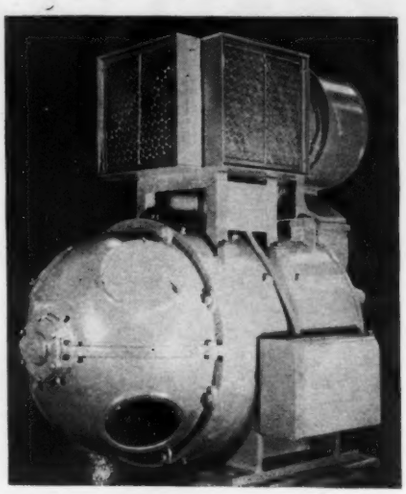
Because of the increased strength provided by the structural member, the bus requires fewer supports than are necessary in conventional construction. At Riverside the supports are spaced at 15-ft. intervals instead of being only about 9 ft. apart as would have been required if the usual copper or aluminum bus had been installed. The forces were computed for 85,000 amp. short-circuit stress. Another important feature of economy is ability to assemble the complete bus in runs of 30 ft. or more previous to erection, a proceeding much less costly than the fabrication of the bus *in situ* with a number of bars, spacers and supports.

The coefficients of expansion due to temperature changes are almost identical for the structural alloy and the pure aluminum in the bus assembly. For this reason it is sufficient to provide expansion joints only between bus sections. This is done by using a simple sliding arrangement of bars under pressure. It is also accomplished by the usual multi-leaved bolted copper expansion joint. Probably the most outstanding economy feature of this type of bus is the fact that attachments for supports and for energy taps can be made with simple bolts or cap screws without any need for expensive clamps made up of machined castings. The illustrations show this feature clearly.



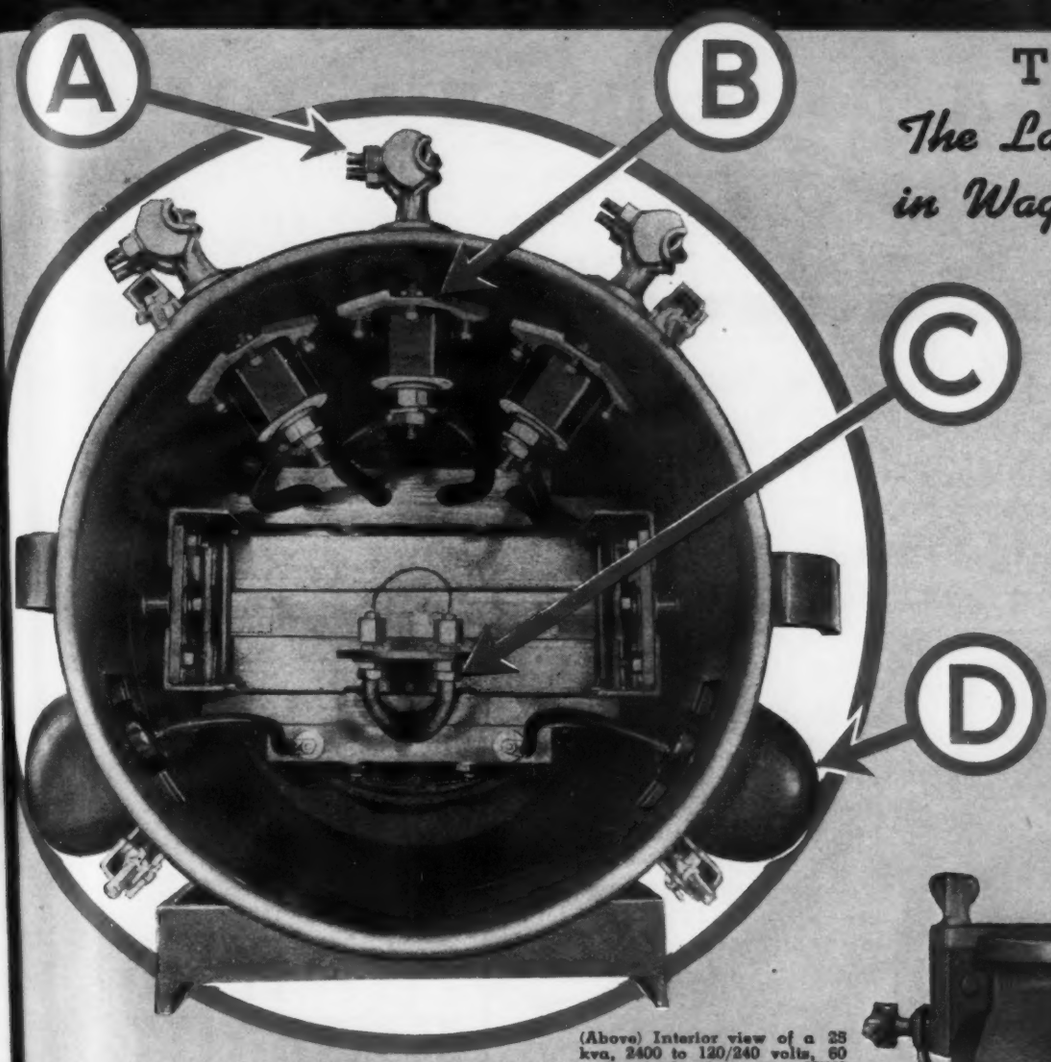
Segregate mechanical and electrical functions
In this new bus design the inner member, which appears in the end-on view, is a channel of structural aluminum alloy. The conductor is comprised of the two angles of pure aluminum forming the hollow square section.

Special Ventilation for 75 Deg. Rise Motor



Special spun-glass filter and blower unit atop this 250-hp., 230-volt, 400/1,200 r.p.m. glass-insulated d.c. motor allows continuous operation with a 75 deg. C. rise temperature above ambient. Filters were needed to purify the dust- and smoke-laden air of the metal working plant where the motor will be used. Ventilating equipment was mounted atop the motor to conserve space. Two such units just built by Allis-Chalmers Manufacturing Company, Milwaukee.

A NEW, MODERN Distribution Transformer



(Above) Interior view of a 25 kva, 2400 to 120/240 volts, 60 cycle, single-phase, type HEX distribution transformer.
(Below) A 3 kva showing the new pocket type primary bushings.

TYPE HEX

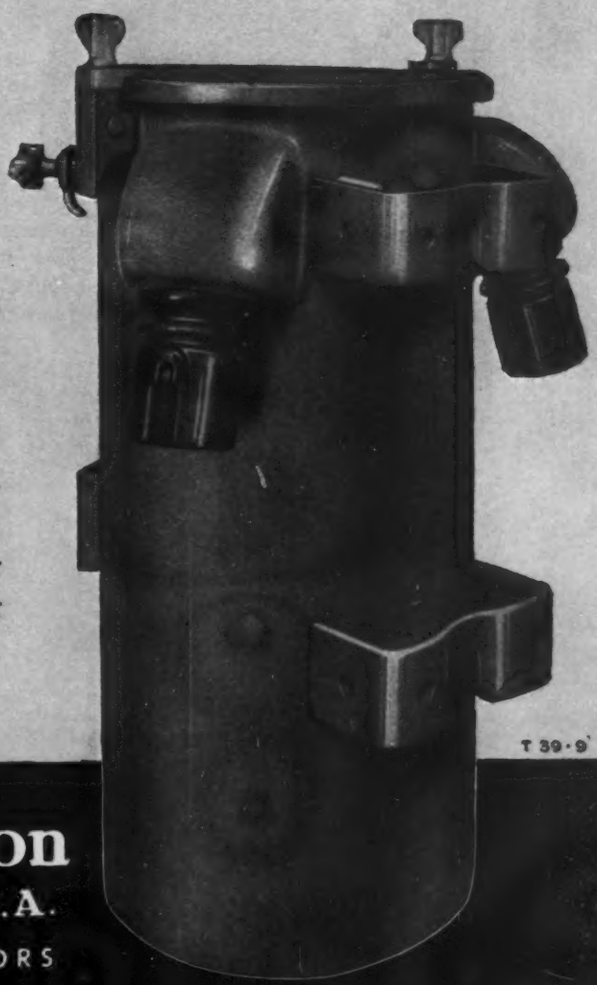
The Latest Development in Wagner Transformers

A Solderless connectors on all bushing terminals make installation easier. The insulation level of the bushings and windings are so coordinated as to cause abnormal line surges to flash over the bushings on the outside of the tank.

B Each bushing is of the removable type, held definitely and positively in place by means of a simple clamping ring assembly.

C Disc type interchanging device consists of taps terminating in studs fastened in a bakelite disc.

D The one-piece copper-bearing steel bushing pocket is securely welded to the tank wall giving it a streamlined appearance.



ddition to the above features, this new Wagner distribution former has many other advantages and like all Wagner formers it is designed to give high efficiency and depend- uninterrupted service.

e line of Wagner transformers is complete and includes stud- ing type distribution transformers, sub-station transformers, l-line transformers, air-cooled transformers and power formers. No matter what your requirements are Wagner formers will do the job.

Write for Complete Literature

agner Electric Corporation

00 Plymouth Avenue, Saint Louis, Mo., U.S.A.

NSFORMERS • BRAKES • FANS • MOTORS

LOAD BUILDING

Better Color Matching With Fluorescent

Before the U. S. Color Card Company installed fluorescent lighting in its color matching department it depended on daylight to match colors on celluloid color books, paint cards and mailing folders. Variation in daylight from hour to hour made the task difficult until fluorescent lighting was introduced. With two 30-watt, 36-in. fluorescent daylight lamps mounted in the fixture shown 30 in. above the judging table 40–45 ft.-candles of daylight quality illumination is obtained, which allows colors to be matched at any time. The company reports that it is very much pleased with the results achieved through use of these lamps, especially during dark winter months.

Courtesy Commonwealth Edison Company

Fluorescent provides 40-45 ft. candles for color matching in Chicago plant

•

Wisconsin Tries Free Electricity

By DALE REMINGTON
Advertising Manager
Wisconsin Public Service Corporation, Milwaukee

Not often does the utility customer who would "like to use more electricity, but it costs too much" ever anticipate getting it free. But, for the second time in four years, Wisconsin Public Service Corporation has offered free electricity to residential, commercial, urban and rural customers. It was made possible during April, May and June of this year by an anticipated excess of water power during spring months. Under the plan customers were offered all the energy they cared to use for no more per month than they paid in March. All energy in excess of their March consumption was free.

As presented, the plan represents a close approach to premium merchandising that has been a considerable success for national advertisers. It employed, on a small scale, much of the showmanship of such selling and to the sponsoring company it brought distinct advantages:

1. An unquestioned boost in the use of electrical service during the period of the plan.

2. A probable improved appreciation of the value of service and perhaps a consciousness among customers that, even when deliberately wasted, electricity is a cheap commodity.

3. A definite public relations value; presenting the company to its customers as alert yet free and generous.

In the light of current and past experience with the plan certain facts appear abundantly clear with regard to its acceptance and functioning. First of all, the customers liked the plan once they tried it. It is estimated that 50 per cent of the people understood the plan and that 75 per cent ceased being suspicious of its gold brick appearance.

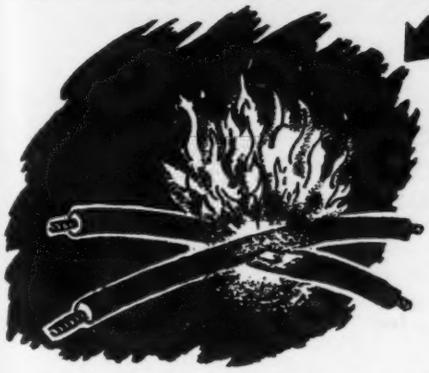
Second, while there is some question as to the permanent increase in sales as a result of the previous 1935 plan, it is generally felt that there

Again... abundant water power makes possible
FREE
ELECTRICITY
You may use all the electricity you care to until the date of your June (1939) meter reading and the net monthly cost to you will not exceed the amount of your March bill.
NOTHING TO WAIT FOR . . . Start using FREE ELECTRICITY now . . . pay no more in April, May, or June than the amount of your March bill.
This spring offer extends to all PUBLIC SERVICE customers receiving service under the residential, rural, and commercial lighting rates. It does not apply to cottages, resorts and other seasonal customers, nor to one cent water heating service, nor to commercial heating or industrial power users.
Unusually abundant rainfall last fall and moderate snow this winter make this FREE ELECTRICITY offer possible. If you wish added information, call at or phone your Public Service office.
WISCONSIN Public Service CORPORATION

Mother Nature provided (1) unusual rainfall and snow and (2) Wisconsin Public Service with an opportunity to supply added power free of charge

are certain advantages to the company in being able to make the offer and that intangible results warranted its repetition. In 1935 about 35 per cent of the customers availed themselves of the offer. Preliminary 1939 figures indicate that this percentage

Facts about Fire!

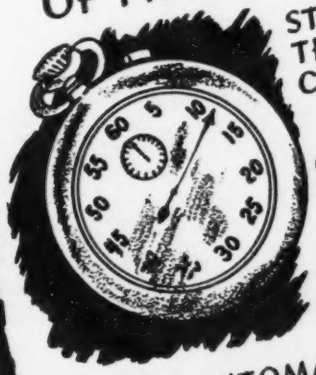


IT'S FLAME, NOT "GLOW," THAT DAMAGES ROTATING ELECTRICAL EQUIPMENT

WHEN YOU KILL FLAME NO FURTHER DAMAGE IS DONE, IF THE MACHINE IS CUT OUT.

CONTRARY TO GENERAL BELIEF, THE GLOW WHICH REMAINS WILL NOT EXTEND THE DAMAGE, UNLESS RE-IGNITION OCCURS.

SPEED IS THE ESSENCE OF FIRE CONTROL

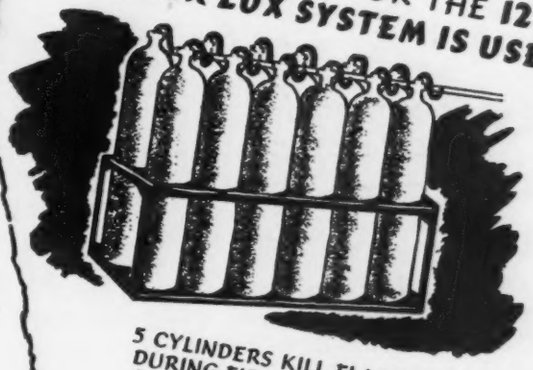


STOP FIRE IN THE FIRST FEW CYCLES—

10 TO 15 SECONDS

—AND YOU LIMIT FIRE TO THE POINT-OF-RUPTURE **BY KILLING THE FLAME.** AUTOMATIC **LUX** BUILT-IN SYSTEMS WORK INSTANTLY AND USE THE FASTEST KNOWN EXTINGUISHING AGENT—CARBON DIOXIDE GAS.

FIRE CONTROL LASTS 30 MIN. IN A TYPICAL 30,000 K. V. A. ENCLOSED GENERATOR THE 12 **CYLINDER LUX SYSTEM IS USED**



5 CYLINDERS KILL FLAMES DURING FIRST 15 SECONDS OF FIRE. 7 OTHER CYLINDERS DISCHARGE PERIODICALLY OVER 30 MINUTE PERIOD TO CONTROL GLOW UNTIL MACHINE HAS RUN DOWN.

Confine fire to the point-of-rupture by killing flame in the first 15 seconds. This is your best guarantee for uninterrupted service.

We have heard of a Lux-protected frequency changer which was back *in service 3 days after a fire.* Only split second fire control can give results like this.

Protect rotating equipment, oil switches, transformers, etc. with Lux Built-In carbon dioxide fire extinguishing systems. For small motors, lesser hazards, have Lux Portables ready at hand.

Write today for "LUX Makes the Difference." It describes LUX Built-In Systems for public utility plant protection. It gives you the highlights on LUX Portables. If you are planning new construction read this book thoroughly. Write today. Send the coupon.

Walter Kidde & Company
1028 West Street, Bloomfield, N. J.

Send me free brochure, "LUX Makes The Difference (between an incident and a disaster)", which describes modern fire control methods.

Name .....

Company .....

Address .....

will probably be higher, particularly for commercial customers who gain most from extra use at little or no cost.

Third, regarding the effect of the plan on appliance sales by dealers, some unexpected appliances were undoubtedly sold, possibly room heaters being leaders. Dealers were potent users of the idea "Buy now and get at least two months of free use." Many sales were made months ahead of the expected normal.

Promotion and advertising of the plan were generous. Full- and half-page announcement advertisements completely explained the plan. News stories appeared in all the papers. Ninety-inch and smaller follow-up advertisements illustrated the added-use possibilities. Announcement stickers on bills stated the amount of the base bill, the period of the offer and use suggestions. Posters were used in utility and dealer stores and windows. Share-cost newspaper advertising and radio programs plugged the plan daily for two months. Direct mail to commercial customers told of the plan and a new commercial rate that was introduced at the same time.

•

Window Shopping for More Kilowatt-Hours

By C. R. TRACY

Illuminating Engineer
Sioux City Gas & Electric Company

FOR some time we had considered the advisability of spending a few hours in the evening, once or twice a week, for the purpose of window shopping to determine for ourselves the number of burned-out lamps, lamps of wrong sizes and complete outages in the store windows of the business section of our city. Accordingly, February 1, 1939, between the hours of 8 and 9 p.m., a survey was conducted, as an experiment, in just one block of the Sioux City business section. Notes were made, and out of a total of 34 show windows fourteen establishments were found to have burned-out lamps, lamps too small for the reflectors, or were only using a portion of their lights. After making this inspection, calls were made at the rate of about three per day for the purpose of directing the store managers' attention to the facts as found a few nights previous.

Here are some examples of the results of the calls in this block:

A music store was found to have five 75-watt lamps burned out. The manager was very receptive to the suggestion that they be replaced and agreed to do so.

The proprietor of a ladies' dress shop thanked us for calling and replaced two 100-watt lamps which were burned out.

In a shoe shop they were also very courteous for our calling their attention to three burned-out 150-watt lamps and also the fact that only half of the window lights were in use. They agreed to use all of them during the evening hours.

In a men's clothing store our man suggested that all of the reflectors were in need of a good cleaning and that 115-volt lamps be used in place of 120-volt. The manager complimented us on the service we were rendering.

At a ladies' dress shop they were acting under orders from their main office, to use only every other light in the window during the slack season. Our man pointed out that their neighboring competitors were using the window lights to full advantage, and as a result of this call the manager stated he would start using all of his window lighting.

A ladies' ready-to-wear store replaced five 200-watt burned-out lamps while our man was still in conversation with the manager.

In a 5-and-10-cent store it was found that eight 100-watt lamps were burned out and the window trimmer in this institution received a polite hint from the manager to watch and replace all burned-out lamps more promptly.

A ladies' hat shop replaced four 150-watt lamps.

Summarizing the results of the survey in this one block, we find that we obtained 4.22 kw. added load, with an estimated consumption of 6,161 kw.-hr., producing an E.A.R. of $154.02.

Similar surveys were conducted in each of the other blocks of the downtown business section and in the three outlying suburbs. While not as productive as the downtown business section, it was felt that the time spent in the outlying districts in making the inspections and the follow-up created customer good will. Eight evenings, with a total of fourteen hours' time, was consumed in making inspections of approximately 600 store windows. This is about 45 per cent of all the stores in the city. Calls were made through February and April. Prospects for many time clocks were found and the names of these merchants were turned over to local dealers.

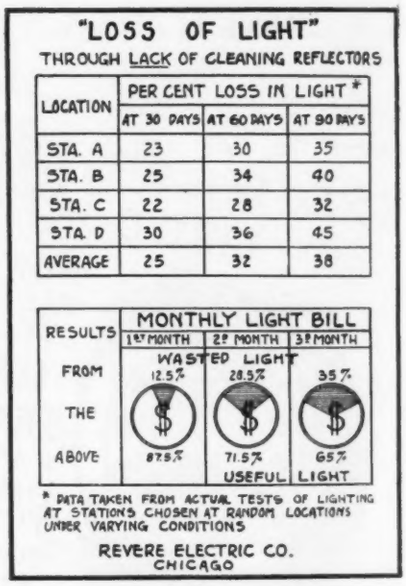
A summary of the total activity shows 75 stores, or 12½ per cent of all inspections, were subsequently called on, resulting in 36.6 kw. added load with an estimated kilowatt-hour consumption of 39,085 and $1,227.12 E.A.R. The E.A.R. was based on a total of 1,460 hours use of the added load throughout the year at an average rate of 2½ cents per kilowatt-hour.

The time consumed in making the calls might be classed as fill-in time and supplemented the regular duties of the members of the illumination department. This will be an annual winter activity from now on.

•

Clean Floodlights for Night Profits

Increased satisfaction from commercial lighting installations is anticipated from a "wash your equipment every week" campaign inaugurated among filling station operators by Revere Electric Company.

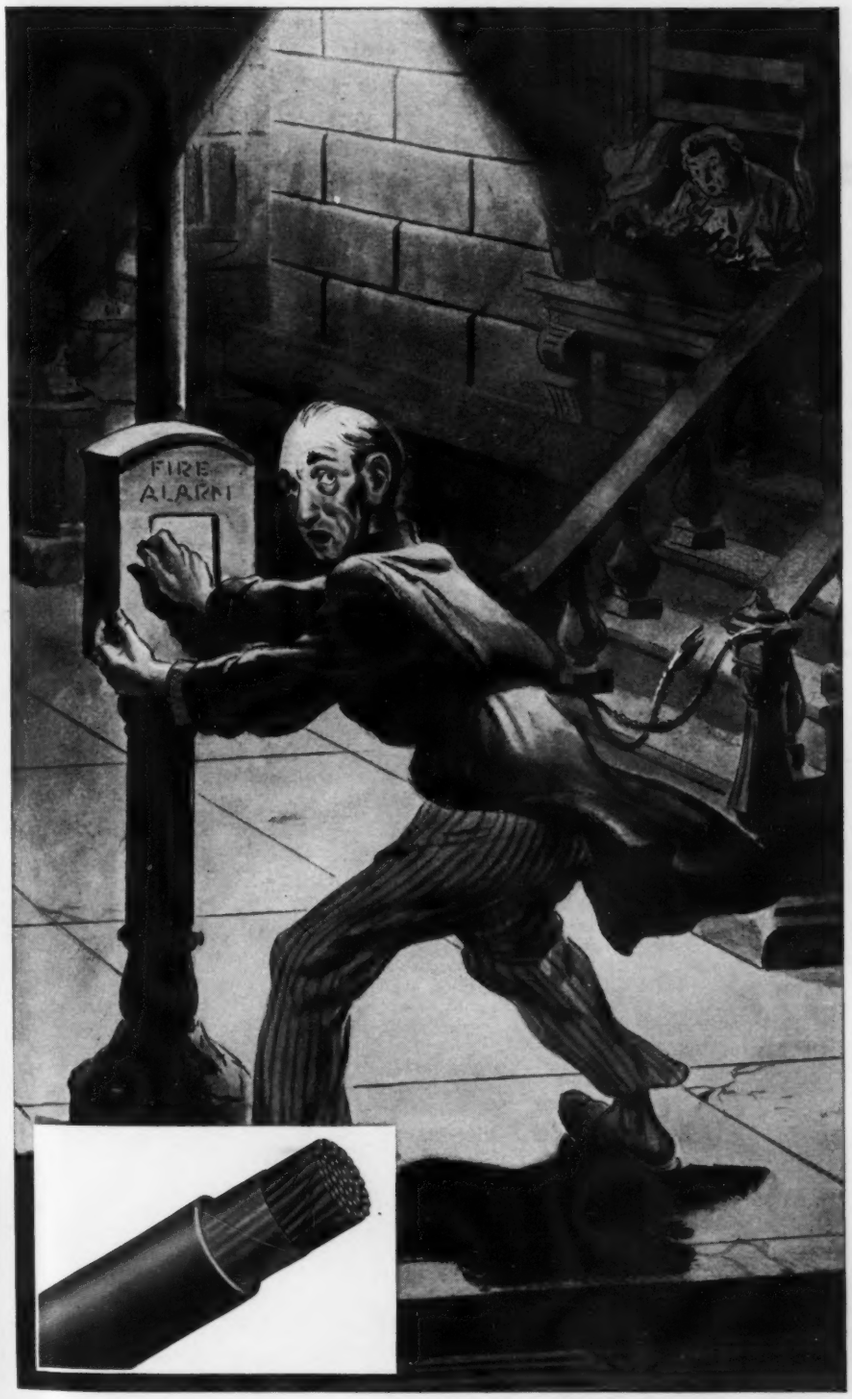


12½ to 35 per cent of the customer's lighting dollar is wasted, Revere Electric has found, when gasoline service station attendants neglect cleanliness of lighting equipment

Utilities have devoted a generous allotment of time and effort to building up plus lighting in filling stations, employing the latest light sources and luminaires. The load has been subject to a mortality index, due in part to the tendency of these installations to gather dust and dirt, which impairs their effectiveness and value.

By showing filling station operators the amount of light wasted if equipment is not cleaned regularly, it is hoped that weekly cleaning schedules will be effected with resultant longer use of equipment and greater customer satisfaction.

From Fire Alarm Cable to



WEATHERPROOF

OVER 60 TYPES OF ROEBLING ELECTRICAL WIRES AND CABLES

Power Cables: Paper; Cambric; Rubber

Parkway Cable

Police-Fire Alarm Cables

Service Entrance Cables

Network Cables

Magnet Wire

Rubber Covered Wires and Cables: Code; Performance; and Heat Resisting; Plain Rubber 60% sheath Power Cable, and 40% or 60% sheath Flexible Cords

Slow-Burning Wires and Cables

Bare and Weatherproof Wires and Cables

Submarine Cables

Appliance Cords

And a wide variety of other wires and cables, either Standard or to Customer's Specifications

QUICK SHIPMENT

Prompt Service is available at all offices and warehouse points listed below, where large stocks of a wide variety of standard Roebling Wires and Cables are always on hand. Your request for information, prices or samples will be welcomed.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, N.J.

Atlanta, Boston, Chicago, Cleveland, Los Angeles New York, Philadelphia, Portland, Ore., San Francisco, Seattle. Export Dept., New York

IF IT'S ELECTRICAL WIRE OR CABLE ROEBLING HAS IT!

NEW EQUIPMENT

Chart Recorder

Thermal demand strip chart meter uses a 6¼-in. wide chart, the load curve record being made by periodic tapping of a depressor bar on the indicating arm, which in turn prints through a moving carbon ribbon. The ribbon life varies from six

Type "TWG" 5-amp., 120-volt strip chart recorder using 1-in.-per-hour chart speed. **Therm-Electric Meters Co., Inc.**, Ithaca, N. Y.

months to a year. Any point on the curve is the lagged demand. Meters are available in either 15- or 30-minute lagged demand periods. Chart speeds may be obtained in ⅛, 1 or 2 in. per hour. The recording instrument is adapted to kw.-ampere or kva. demand measurement.

•

Fluorescent Fixtures

One- and two-light wired fixtures for fluorescent lamps. **Day-Brite Lighting, Inc.**, St. Louis, Mo.

Units made up of different reflector shapes are offered as complete, efficient units for utility applications. Fixtures are completely wired, including auxiliaries and sockets, ready for installation.

•

Conduit Bender

"S-36" "Porto-Power" pipe and conduit bender; bending shoes handle up to 4-in. diameter conduit or tubes. **Blackhawk Mfg. Co.**, Milwaukee, Wis.

For bending or straightening steel conduit this portable hydraulic powered unit will operate in horizontal, vertical or angular positions. An automatic retracting ram is used; it is said to develop 20 tons of power, a modification of the 10-ton ram announced in a previous issue of ELECTRICAL WORLD. The tool is intended for cold-bending work.

•

Angle Socket

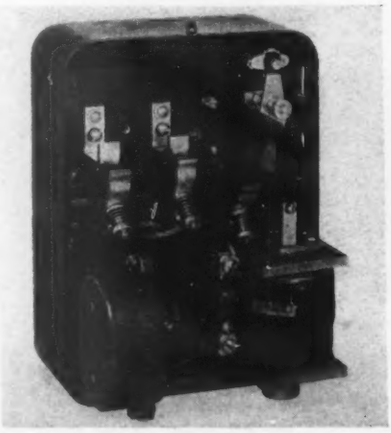
Angle socket, "No. 971-I"; will accommodate standard lamps from 15 to 100 watts, inclusive. **National Electric Products Corp.**, Pittsburgh, Pa.

This new socket is claimed to make "Plug-In" strip flexible for lighting arrangements. The 6-in. spacing provides uniformity and eliminates need for careful measurement. Lumiline, tubular and standard-shaped lamps may be interchangeably used and lighting arrangements changed at will, the company states.

•

Starter

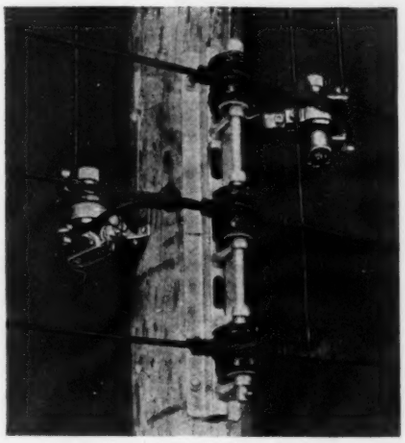
This new starter is for use with constant-speed motors up to 1,800 r.p.m. that do not require more than 150 per cent of full-load torque to start nor longer than ten seconds to attain full speed. It consists of a solenoid-operated multi-finger contactor with an overload relay. A new time-delay escapement mechanism restrains the shaft in the starting motor, but permits quick opening through the action of a positive over-running clutch. An isothermic overload relay provides for improved overload protection; it is set for either manual or automatic resetting.



D.C. definite-mechanical-time starter for general-purpose constant-speed motors; rating up to 5 hp., 115 volts, and 10 hp., 230 volts, d.c. **General Electric Co.**, Schenectady, N. Y.

Low-Voltage Cutout

A new cutout for use on low-voltage distribution systems to prevent transformer failures, to isolate faulty sections in an interconnected or "banked" system of secondaries, and to protect against overfusing and provide a convenient means



Type "LV" low-voltage cutout, rated at 250 volts, 100 amp., with interrupting capacity of 5,000 r.m.s. amp. **Schweitzer & Conrad, Inc.**, Chicago, Ill.

for disconnection in customers' service. It can be fused with standard primary distribution fuse links having button heads, or with links made for secondary service carrying a button head. Fuse-link replacement is said to introduce no hazard; blown fuses are detected by an indicator arm with red reflector.

•

Multi-Breaker

Type "MO" multi-breaker; 15, 20 and 25 amp., 115, 115-230 volts a.c. **Trumbull Electric Mfg. Co.**, Plainville, Conn.

This new type of breaker, single pole or double pole, for short circuit and overload protection to motor, lighting and high wattage circuits, is a recent addition to this company's line.

•

Truck

Cab-over-engine trucks. **International Harvester Company**, Chicago, Ill.

The heavy-duty cab-over-engine field has been entered by this company with trucks having capacity rating of 12,300

—BUT WHEN THERE ARE MILLIONS IN THE AIR

—YOU CAN BE CERTAIN

THAT GOOD DAYS HAVE ARRIVED—
JUST AS MILLIONS OF HUBBARD
4-11-44 WIREHOLDERS IN USE ARE
POSITIVE PROOF OF THEIR QUALITY.

HUBBARD AND COMPANY

PITTSBURGH ---- OAKLAND ---- CALIFORNIA ---- CHICAGO

"HANG THE LOAD ON HUBBARD HARDWARE"

RUBBER COVERED POWER CABLES • BUILDING WIRE • VARNISHED CAMBRIC • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • ARMORED CABLE • CRESFLEX NON - METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

Born to Resist Moisture!

CRESCENT IMPERVEX

INSULATED WIRE and CABLE

Here is a special moisture resistant insulating compound used on building wires and secondary network cables without lead sheath, in moist locations. CRESCENT IMPERVEX is not only highly resistant to water absorption, but it is also superior in its resistance to the effects of ground acids and alkalis. . . . And one thing to remember—IMPERVEX is made ONLY BY CRESCENT.

CRESCENT INSULATED WIRE & CABLE CO. INC

TRENTON, NEW JERSEY

Atlanta Baltimore Boston Buffalo Chicago Cincinnati Cleveland
Detroit Indianapolis Kansas City Los Angeles Minneapolis
New Orleans New York Philadelphia Pittsburgh St. Louis San Francisco

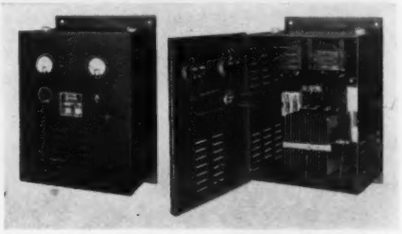
CRESCENT ENDURITE SUPER - AGING INSULATION

lb., to be used as straight trucks or truck-tractors adaptable to work where short overall length is an operating or legal necessity.

•

Selenium Rectifier

Selenium plates form the rectifying medium in this rectifier, which operates on principle similar to other types of dry plate rectifiers. In selenium rectifiers, according to the company, fewer and smaller plates are required for a given voltage-



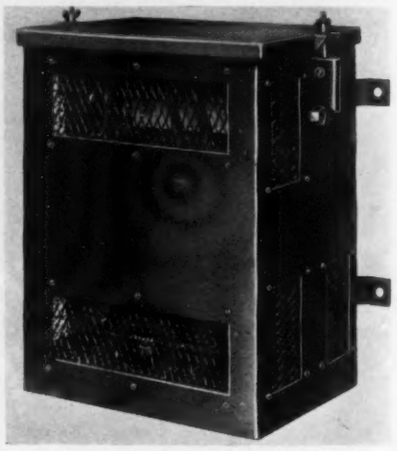
Type "SR" heavy-duty rectifiers; in full-wave bridge and half-wave types. **Fansteel Metallurgical Corp.**, North Chicago, Ill.

current output. Efficiency is said to be affected very little by temperature, obviating blowers or special cooling equipment. Output is stated to be lowered only slightly by age, rectifiers will withstand an overload of 75 per cent for several hours and power factor is placed at nearly unit.

•

Air-Cooled Transformer

A new air-cooled transformer is available for industrial applications. Sizes up to 750 va. capacity have compound-filled



Air-cooled transformer, for 550 to 110/220 volts; 1 va. to 10 kva.; 50/60 cycles. **Ferranti Electric, Inc.**, New York, N. Y.

cases with terminals, lead and mounting feet. The 1,000-, 1,500- and 2,000-va. units are in ventilated, air-cooled, sheet steel cases.

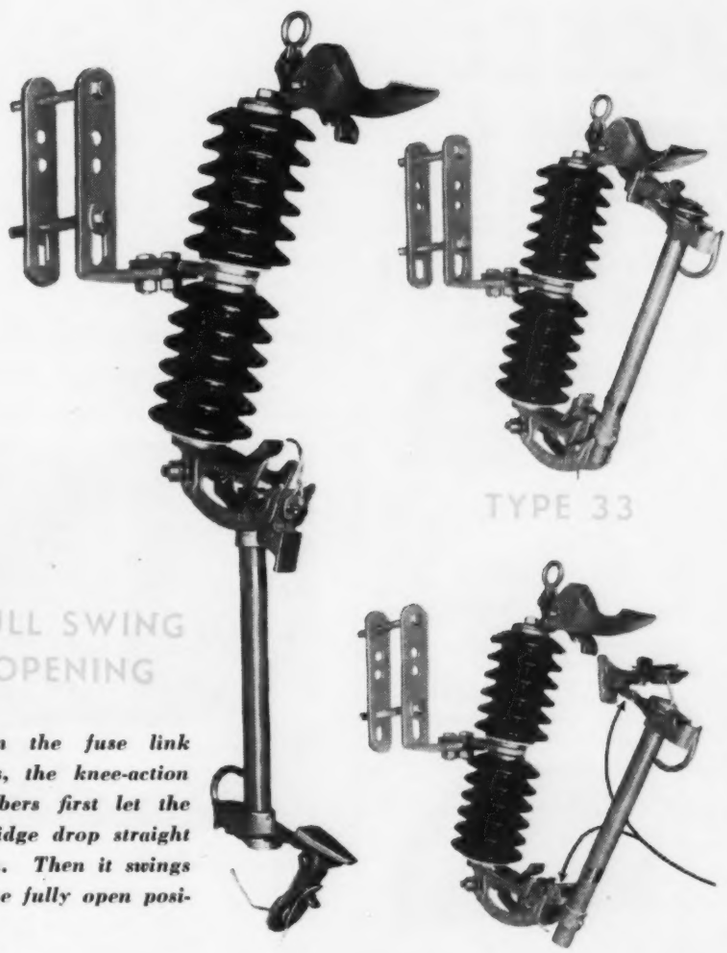
•

Motor

Thermoguard motor for domestic oil burners; split-phase, 110 or 220 volt. **Westinghouse Electric & Mfg. Co.**, Pittsburgh, Pa.

This new feature is offered as protection against burnout caused by continuous or frequently repeated overloads, high ambient temperature, high motor current due to locked shaft or low voltage and conditions causing a dangerous temperature.

1940 MODEL-IMPROVED CARTRIDGE DROPOUT CUTOUTS



When the fuse link blows, the knee-action members first let the cartridge drop straight down. Then it swings to the fully open position.

The improved Type 33 Cutouts provide the highest degree of protection between your generators and your customers' equipment—. They help further your public relations program . . . and reduce your maintenance costs. For years, principles incorporated in S.S. Cutouts have been freely imitated by others. Specify S.S. Cutouts . . . GET THE BEST . . . AND SAVE MONEY.

Consider these features:

- **Solderless Connectors—for upper and lower line connections.**
- **Adjustable Cross Arm Hanger.**
- **High pressure copper contact finger.**
- **Interchangeable Insulators—Fog Type Design, Wet Process Porcelain.**
- **Lifting Lug on Cartridge.**
- **Cartridge with Knee-action members at top and bottom of tube.**

Write for Bulletin No. 178

IT'S AN ORIGINAL SS PRODUCT

SOUTHERN STATES EQUIPMENT CORP.

BIRMINGHAM, ALABAMA

Representatives in Principal Cities

MEET TODAY'S DEMAND

for faster, safer Cable Joints

CONDUCELL

pre-formed and pre-tested

CABLE JOINT INSULATION

Transmission men need no crystal ball to foresee increased load demands in the *immediate* future. This calls for more cable joint work, prompt action all along the line.

SPEEDS JOINT MAKING

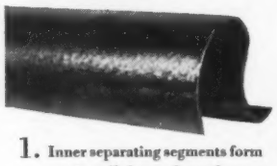
For 25 years Conducell, the pre-formed Micanite high tension cable joint insulation has been eliminating joint troubles . . . permitting more completed joints in a given time . . . cutting exposure time of cable insulation.

INSURES DEPENDABLE WORK

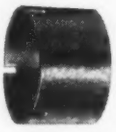
By assuring a predetermined and uniform amount of insulation, by eliminating air pockets and voids . . . in short by removing the uncertainty of manhole workmanship . . . this factory-formed insulator has proved its effectiveness in making the joint as dependable as the cable itself.

Mica Insulator Company, 200 Varick Street (Dept. 41), New York; 542 South Dearborn Street, Chicago; 1276 West 3rd Street, Cleveland. Birmingham, Boston, Cincinnati, Los Angeles, San Francisco, Seattle. Montreal, Toronto.

Conducell is a *tested* joint *before* you put it in the ground!



1. Inner separating segments form a separate cell for each conductor.



2. Spacing ring insures the same separation and amount of compound between each conductor.

3. Sections in position, ready for the outer tube to be drawn over.

MICA INSULATOR COMPANY

MICANITE . . . EMPIRE VARNISHED INSULATIONS . . . LAMICOID LAMINATED PLASTIC MATERIALS

One type is the time-delay designed for burners with intermittent ignitron systems. When the temperature within the motor reaches a certain point the circuit is opened and is not closed until a definite interval elapses. The manual-reset type is built so that its reclosing temperature is below any ambient temperature.

•

Photo-Electric Control

A device for counting of people or objects, for burglar protection with alarm signals, for opening doors, etc., this instrument is a complete electric eye system. When the objects measured interrupt a beam of light the power relay closes and

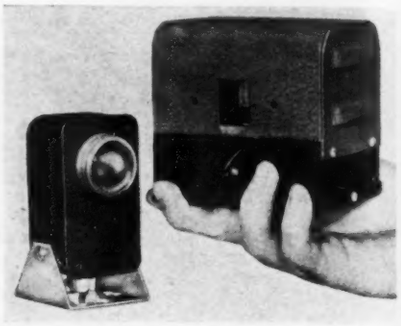


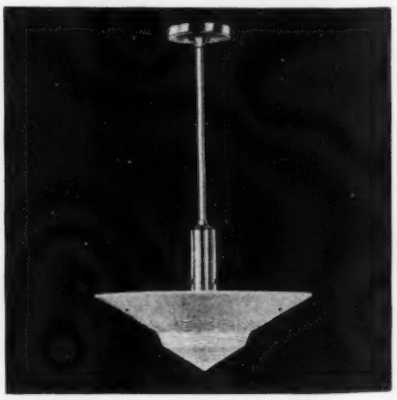
Photo-electric control operates on 110 volts, 60 cycle, a.c. only. **United Cinephone Corp.**, 43-37 Rawson St., Long Island City, N. Y.

the electric device plugged into the control operates. Current supply to light source is supplied from transformer within control. Power relay designed for 3-amp. non-inductive loads. Potentiometer adjustment permits compensation for various degrees of light intensity to photo-cell.

•

Semi-Indirect Glass Bowl

New, dense, opaque, two-tone glass bowl is slightly off a flat white unlighted and is a golden tan when lighted. Total



Semi-indirect pressed luminous glass bowl. **Gillinder Brothers, Inc.**, Port Jervis, N. Y.

light output over 85 per cent. Surface brilliancy ranges from 0.2 to 2.0 candlepower per square inch brightness.

•

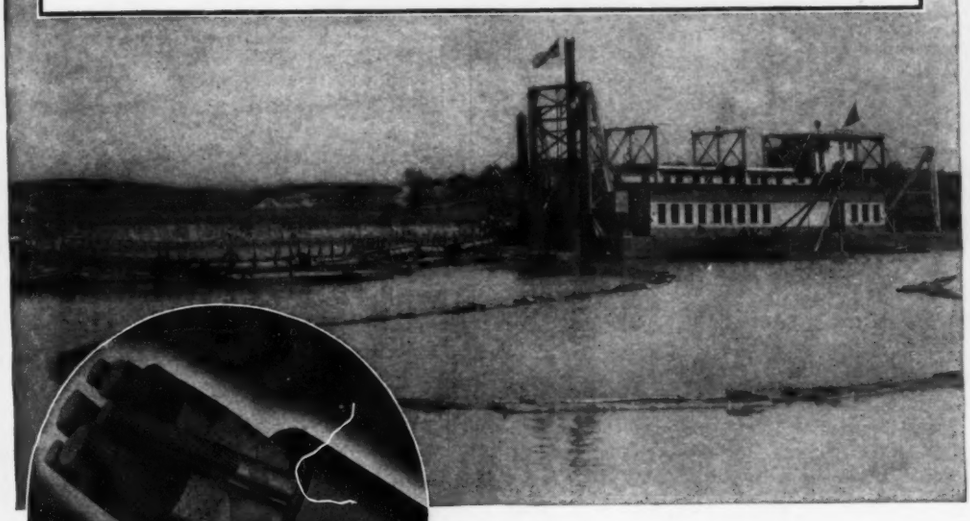
Copper Braid

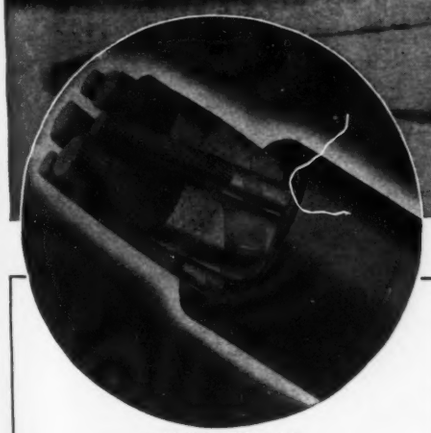
Flexible copper braid of high-ampere capacity. **Burndy Engineering Co., Inc.**, 459 East 133d St., New York, N. Y.

New copper braid may be used in welding equipment because it is stated to carry instantaneous currents up to 30,000 amp. The inner ends of the copper fer-

IN THE "BIG LEAGUE"... OR IN THE "BUSHES"

You'll find Amerclad Cords and Cables Doing the Important Jobs





ONE-FOURTH ACTUAL SIZE

THIS AMERCLAD CABLE, rated at 13,200 volts, contains three insulated conductors, each 500,000 c.m., and three ground wires, each No. 4/0 A.W.G. flexible copper strand. It weighs nearly 18 pounds per foot and has an outer diameter of 4½". Each of the insulated conductors is electrically shielded by a braid of tinned copper wires. Between the rubber insulation and copper braid, in intimate contact with both, is a fabric tape specially treated to provide a semi-conducting layer.

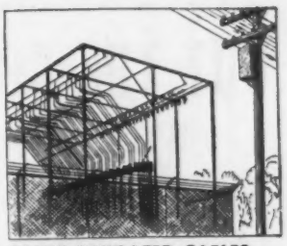
AMERCLAD *All-Rubber* **CORDS & CABLES**

THE Amerclad Dredge Cable illustrated here is the biggest of its kind in the world. Its job is to deliver power to the huge floating dredges used in the construction of the Sardis Dam—an important U. S. Government Flood Control Project.

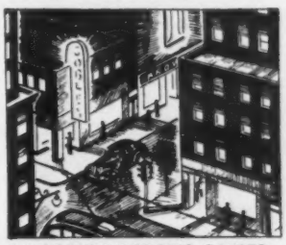
Today all jobs are important, whether big or little. And all along the line you will find Amerclad Cords and Cables doing big and little jobs efficiently and economically.

The outstanding features offered by Amerclad Cords and Cables are their rugged toughness, light weight and flexibility. An outer sheath of resilient "tire-tread" rubber protects the insulation from damage. Amerclad Cords and Cables are available in a wide range of types and constructions. Full details will be sent to you upon request.

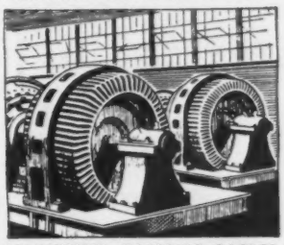
ADEQUATE WIRING SERVES AND SAVES



PAPER INSULATED CABLES

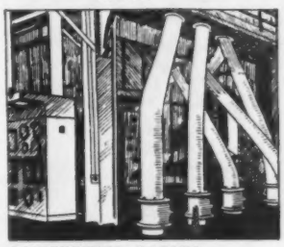


AMARINE NETWORK CABLES



VARNISHED CAMBRIC CABLES

RELIANCE WEATHERPROOF WIRES



AMERBESTOS CABLES

PARKWAY CABLES

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

CUT THE COST OF CONDUIT BENDING AND PIPE PUSHING

With Greenlee Hydraulic Tools

Hydraulic Conduit and Pipe Benders

Much time and money can be saved by using Greenlee Hydraulic Tools for bending conduit and pipe. Not only do they do the work faster, but they make a better job of it with much less effort on the part of the workmen. They are simple to operate and easy to take to the job. No. 770, shown to the right, bends all sizes of conduit from 1¼" to 3". The larger size, No. 775, bends all sizes from 3" to 4½". Attachments can be furnished for thin-wall steel conduit.

Ask Now for COMPLETE DETAILS

Hydraulic Pipe Pusher

With this hydraulic pusher, one man can stand in a comfortable position and send pipe under streets, sidewalks, lawns, etc., simply by pumping the handles. It saves money and makes it unnecessary to do extensive trenching. Because of its compact design and simple construction, it is easy to set up and move about. Capacity for pipe up to 4".

GREENLEE TOOL CO., 1705 Columbia Ave., ROCKFORD, ILL.

BURNDY ENGINEERING CO., INC.

rules are belled to prevent excessive stress concentration in the strands as they leave the ferrules. Curved or straight braid assemblies, with the ends compressed into a solid mass in the ferrules, are made for any ampere capacity.

•

Clamps

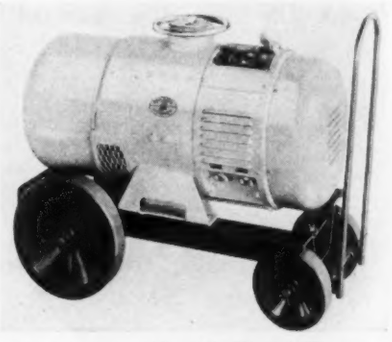
A.C.S.R. clamp for use over armor rods; "R1" for No. 4 to 1/0 A.C.S.R. over armor rods and No. 8 to No. 2 copper or up to ⅜ in. Copper-weld; "R2" for No. 4 to 1/0 A.C.S.R. over armor rods, tap-off wires up to No. 2 A.C.S.R. up to ⅜ in. galvanized steel, up to No. 4 Amerductor and No. 9 to No. 6 solid iron. **H. B. Sherman Mfg. Co.**, Battle Creek, Mich.

This new clamp features one-piece construction: Screw which need not be removed, a large groove for A.C.S.R. with armor rods and a small groove for tap-off wire. Made of bronze, electro-plated to insure good contact with aluminum wire.

•

Arc Welder

A single-operator motor-generator arc welder, requires only one control device for operation, a handwheel located on top of the unit permitting an infinite number of current settings. Single-pole control design gives a steady current out-



"Hornet" arc welder, 200, 300 and 400 amp., a.c. and d.c. models. **Wilson Welder & Metals Co., Inc.**, 60 East 42d St., New York, N. Y.

put, resulting in a constant, uniform arc at all times. Polarity can be changed only by a small snap switch controlled by the operator. A two-bearing unit, with motor rotor and generator mounted on a common shaft, it has adequate ventilation furnished by propeller blades attached to the revolving shaft. For use with arc electrodes or bare electrodes.

•

Receptacle and Pilot

Three-wire receptacle and pilot, No. 7855. **Arrow Hart & Hegeman Electric Co.**, Hartford, Conn.

For three-wire systems, this new one-gang unit of three-wire plug outlet and red jewel pilot light shows instantly when current in outlet is being consumed.

•

Portable Airmeter

Direct-reading portable airmeter, pressure range from 0 to 0.3 in. of water, velocity range from 300 to 2,000 ft. per minute. **Julien P. Friez & Sons**, Baltimore, Md.

Measurement of static pressure, air velocities and stack drafts can be read directly from a pointer and graduated scale.

NEWS ABOUT PEOPLE

Commonwealth & Southern Assigns New Duties

Changes in the personnel of several of the subsidiaries of the Commonwealth & Southern Corp. have just been announced.

J. C. Costello

G. Webber

John C. Costello, who has been vice-president of the Tennessee Electric Power Co. in charge of advertising, now goes to the Ohio Edison Co., Akron, as manager of the advertising department. George Webber, who for several years has been director of advertising and publicity for Ohio Edison, has taken up similar work with the Consumers Power Co., Jackson, Mich. Harry Curtis, formerly manager of the lighting sales department of the Tennessee Electric Power Co., Chattanooga, has been appointed head of the lighting sales department for the South Carolina Power Co., at Charleston.

A native of San Francisco and a graduate of the University of California, class of 1916, Mr. Costello entered the employ of the Chattanooga Railway & Light Co., a predecessor of Tennessee Electric Power Co., in power sales work. He has been with this utility system continuously since that time.

H. Curtis

Mr. Webber, after attending Albion College in Michigan, entered the advertising field in Battle Creek in 1930. He joined Ohio Edison in 1933. In announcing the appointment of Mr. Webber to the Consumers Power staff, A. C. Blinn, president of Ohio Edison Co., said: "This well-deserved promotion for Mr. Webber comes to him as a result of the excellent work he has done on the Ohio Edison Co. property."

Mr. Curtis won the Curtis Lighting Award for 1938.

•

▶ E. E. GEORGE has joined the engineering staff of Phoenix Engineering Corp., engineering and construction subsidiary of Ebasco Services Inc., New York. As superintendent of system operation of the Tennessee Electric Power Co. at Chattanooga, Mr. George has been for many years closely identified with the operation and development of electric power facilities in Tennessee. A graduate of Purdue University, Mr. George has been active in the affairs of the American Institute of Electrical Engineers in the South. He is a Fellow of the Institute, past-chairman of the East Tennessee section and recently was elected vice-president of the southeastern district. He is also a member of the Institute of Radio Engineers.

▶ P. V. HAYDEN, sales manager Connecticut Light & Power Co., Windham, has been appointed to the newly created Connecticut Development Commission, which will serve as an industrial agent for the state. This board supplants the former Connecticut State Publicity Commission.

▶ BARCLAY J. SICKLER, formerly chief statistician of the Wisconsin Public Service Commission, has arrived in Portland, Ore., to assume his new duties as head of the Bonneville administration's rate division. Mr. Sickler is a native of Washington. He has done special work on utility rates and economics at Northwestern University and the University of Wisconsin.

▶ CARLTON S. PROCTOR of Moran, Proctor & Freeman, engineers, of New York, has been elected a director of the American & Foreign Power Co., Inc., to succeed George N. Tidd, presi-

dent of American Gas & Electric Co. Mr. Proctor, who is a graduate of Princeton University and a consulting engineer, has spent much time in various parts of South America and in the Far East supervising and advising on engineering projects.

▶ FRANK A. BANKS, formerly acting Bonneville Dam Administrator, who has been succeeded by Dr. Paul J. Raver, has returned to the Grand Coulee Dam to resume the duties he relinquished last May. Mr. Banks was selected by Secretary of the Interior Harold L. Ickes to handle the Bonneville assignment pending the appointment of a permanent administrator.

▶ J. C. BRADFORD, investment broker, has been appointed to the Nashville Electric Power Board by Mayor Thomas Cummings. Mr. Bradford, head of the Nashville company bearing his name, was appointed to an eight-year term. His nomination was confirmed by City Council.

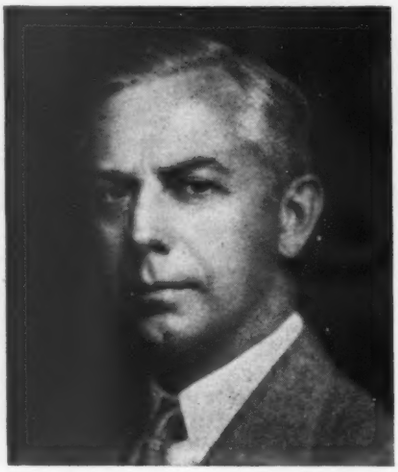
▶ ALFRED H. NICOLL, San Francisco district manager of the Graybar Electric Co., Inc., has been appointed assistant to President Frank A. Ketcham and will make his headquarters in New York after November 1. Mr. Nicoll entered the electrical industry in San Francisco in 1907. Two years later he entered the employ of the Western Electric Co. The past 30 years have been spent with Graybar in the far West. He succeeded to the district managership in San Francisco in 1932 upon the retirement of the late William S. Berry. An active figure in the electrical industry on the Pacific Coast, he has served as chairman of the Pacific Division of the National Electrical Wholesalers Association, is a past-president of the San Francisco Electrical Development League and former chairman of the Business Development Section of the Pacific Coast Electrical Association.

▶ HORACE ZIMMER, for the past year assistant district manager of General Electric Co.'s transportation department in the New York territory, has been appointed manager of the department.

▶ T. S. CAWTHORNE, for the past sixteen years associated with the Weston Electrical Instrument Corp. in the manufacturing and sales divisions, has resigned as a member of the Weston staff to establish himself as a manufacturers' representative in Detroit. Mr. Weston will handle several lines in the electrical equipment field, including instruments manufactured by Weston.

Graybar Electric Names Hawkins Vice-President

At a recent meeting of the board of directors of Graybar Electric Co., Inc., E. A. Hawkins was elected vice-president. Less than two months ago Mr.



Hawkins, who had been assistant general sales manager since 1933, was made general sales manager.

Mr. Hawkins' association with the company goes back to 1899, the year he received his M.E. degree from Cornell University.

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▶ FREDERIC ATTWOOD, vice-president of Ohio Brass Co., has received the rank of knight in the Legion of Honor of France in recognition of his army service in the World War and as vice-president of the International Conference on High-Tension Electric Systems.

▶ M. J. BODNER, senior engineer of the Arkansas Department of Public Utilities for the past three years, has resigned that position to become associate engineer in the gas division of the Federal Power Commission.

OBITUARY

▶ WILLIAM B. MONTGOMERY, superintendent of the electrical department of the Wisconsin Michigan Power Co., died September 16 in Appleton, Wis., following a stroke. He was 53 years of age. Mr. Montgomery was a native of Appleton and had been associated with the power company for more than 20 years.

▶ THOMAS D. PIERCE, Indianapolis consulting engineer, died September 16, after a lingering illness. Since 1931 he had maintained a practice in Indianapolis as Pierce & Associates. He had formerly been with the Indiana Public Service Commission and the Ohio State Public Utilities Commission. He specialized in the field of municipally owned utilities in an advisory capacity. Mr. Pierce was a graduate of the Case School of Applied Science of Cleveland.

▶ CHARLES H. GALLANT, electrical engineer of Seattle, Wash., died in that city September 22, following a ten days' illness. He was 49 years old. From 1912–16 Mr. Gallant was employed in the transmission and distribution division of the Puget Sound Power & Light Co. For the following three years he was contract agent for the Seattle City Light Department. Mr. Gallant served as state electrical inspector for four years and after relinquishing that connection engaged in electrical contracting and construction work in the Puget Sound area.

▶ WILLIAM J. WEST, a member of the engineering staff of the Maryland Public Service Commission for 20 years, died September 15 at his home in Baltimore. He had been ill about three weeks. One of the surviving brothers is Harold E. West, special examiner for the commission and formerly chairman of that body.

▶ CLIFTON P. HUGHES, director of Hackbridge Electric Construction Co., Ltd., and Hewittic Electric Co., Ltd., Hersham Works, Walton-on-Thames, England, died July 7. From 1927-28 Mr. Hughes was connected with the Westinghouse Electric & Manufacturing Co. at Sharon and Pittsburgh, Pa. He became assistant manager of the Hackbridge company in 1929 and director of the Hackbridge and Hewittic companies in 1935.

▶ LANCELOT R. WOODCOCK, divisional chief, Ebro Irrigation & Power Co., Barcelona, Spain, died July 1 at Barcelona, in his fifty-ninth year. Born in Australia, Mr. Woodcock came to the United States and was employed by the General Electric Co., Schenectady, N. Y., in the testing and turbine powerhouse departments, in 1907 and 1908, in that year affiliating himself with the Washington Water Power Co., Spokane, on construction of hydro-electric power plants. In 1915 he returned to Australia, where he became manager of the electrical department of the Engineering Supply Co. of Australia, Brisbane. After spending a year in London, England, in 1919 he joined the Ebro Irrigation & Power Co. at Barcelona. From 1921–1923 he was associated with the New York utility system as engineer on the construction of the Hell Gate and the Sherman Creek power stations. Mr. Woodcock then returned to Spain. He was a member of the American Institute of Electrical Engineers.

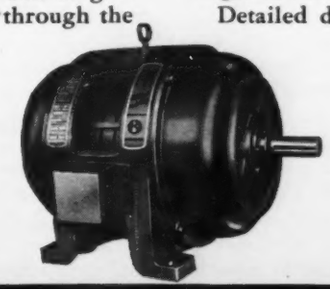
WE'VE DONE IT!

Fairbanks-Morse Is FIRST to Announce a Successful ONE-PIECE Rotor Winding Centrifugally Cast of Pure COPPER

Again Fairbanks-Morse leads the field with the most outstanding advance in motor design since we introduced the ball-bearing motor. Now comes the new COPPERSPUN rotor—a one-piece, squirrel-cage rotor winding, centrifugally *"cast en bloc" of pure copper!*

It took years of experimental work to perfect the process and the equipment which make this one-piece copper winding possible. Blanked laminations are stacked and held under pressure. During the casting process the entire assembly is spun at high speed. Molten copper is poured in at one end only. The opposite end ring is formed by copper that has passed through the rotor slots—giving assurance that it remained fluid during spinning.

The result is a truly one-piece copper winding with the most desirable characteristics obtainable: dense, ductile, uniform structure of high mechanical strength, high electrical conductivity, and low thermal expansion. Thus is provided a new degree of efficiency in motors for severe types of service where greater mechanical strength and ability to withstand high temperatures are becoming increasingly important.



After completion of centrifugal casting, the F-M Copperspun rotor is machine-finished over all surfaces and dynamically balanced to a high degree of accuracy.

Detailed data will not only prove intensely interesting—but is necessary information to those who profit by keeping abreast of electrical development. It will be sent upon request. Write Fairbanks, Morse & Co., Department 26, 600 S. Michigan Ave., Chicago, Ill. Branches and service stations throughout the United States and Canada.

7635-EA40.151

FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
ELECTRICAL MACHINERY
FAIRBANKS SCALES
RAILROAD EQUIPMENT
WATER SYSTEMS
WASHERS-IRONERS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS

F M

Motors

MANUFACTURING - MARKETS

Copperweld to Build Ohio Steel Plant

Copperweld Steel Co. has acquired the assets of the American Puddled Iron Co. at Warren, Ohio, and will erect on the 423-acre property an electric steel plant with nominal capacity of 100,000 tons of alloy steel annually. Announcement of the purchase of the property and plans for construction of the steel plant was made by S. E. Bramer, president of the company.

At the new plant, which will be ready for operation during the first quarter of 1940, Copperweld will produce its own steel for use in the manufacture of copper-covered steel wire, rods and strand.

The announcement stated that it was found impractical to locate the new electric steel plant on the company's main property at Glassport, Pa., in the Pittsburgh district, because of insufficient acreage to permit the installation of furnaces and rolling mills and provide for the possible need of future expansion of the plant.

•

Awards Cable Contract

City Supply Commissioner Victor P. Roach of St. Louis, Mo., has announced that the city awarded a contract for 50,000 ft. of cable for use in the street lighting department to the Westinghouse Electric Supply Co.

•

German Electric Exports

During 1938 the total value of reported electrical products from Germany was $135,000,000. This was distributed as follows: Europe, $97,000,000; Africa, $4,480,000; Asia, $13,480,000; The Americas, $17,960,000, and Oceania, $1,350,000. European combines afforded the largest market. Netherlands, Sweden, Italy, Finland, Rumania, Norway and Great Britain were the leading buyers of German electrical products. In Africa the Union of South Africa and Egypt led the buying. British India, Japan and China led in Asia. Over here Argentine and Brazil were large purchasers and Australia in Oceania. It will be noted that Great Britain and its dependencies purchased large quantities of German electrical products.

•

Cleaner Sales Advance; Pass 950,000 Mark

Electrical vacuum cleaner sales during 1939 passed the 950,000 mark in September, sales to the end of August having totaled 879,543, compared to 838,395 in the first eight months of 1938, an increase of 4.8 per cent, according to C. G. Frantz, secretary of Vacuum Cleaner Manufacturers Association.

August sales were 96,601 units, an increase of 6.6 per cent over 90,557 reported for August, 1938, and an advance of 25.9 per cent over the July, 1939, figures of 76,689.

•

Foreign Trade Council Plans Electric Session

As a feature of the National Foreign Trade Council's annual convention being held at the Commodore Hotel, New York, October 9-11, it has been arranged to have industrial group meeting covering various industries on Wednesday morning, October 11.

The electrical and radio group meeting will be presided over by William E. Knox, assistant general manager of the Westinghouse Electric International Co., who has recently returned from a world wide trip in behalf of his company. John H. Payne, chief of the electrical division, Bureau of Foreign and Domestic Commerce, will act as counselor for the meeting.

TVA Lets Contracts for Hiwassee Dam

Tennessee Valley Authority has announced the award of 14 contracts for materials and equipment valued at approximately $1,000,000.

The electrical materials and equipment included in these contracts were for the Authority's Hiwassee Dam. They are as follows:

Westinghouse Electric & Manufacturing Co., oil circuit breakers, $56,724; American Automatic Electric Sales Co., Chicago, Ill., telephone and signaling equipment, $11,194; The Autocall Co., Shelby, Ohio, equipment for operating recorders, annunciator, and signaling systems, $6,926; and Walter Electric Manufacturing Co., Norfolk, Va., electric freight elevator, $2,840.

•

Lets Municipal Contracts

McPherson, Kan., has awarded contract for a turbo-generator for use in the municipal power plant to the Elliott Co., Kansas City, Mo., and Jeanette, Pa., at $112,310 and for a surface condenser to the Westinghouse Electric & Manufacturing Co., at $37,800.

•

Lets Substation Contract

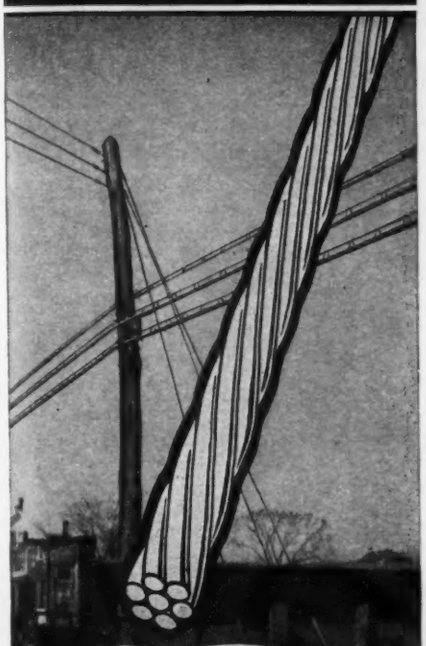
City of Brownsville, Tenn., George Reid, Mayor, has let a contract to the Shelby Electric Co., Memphis, for the installation of a new substation for the electric system. The new improvements will cost $8,264.

•

Will Pay Back Dividend

Emerson Electric Manufacturing Co. has voted to pay the quarterly dividend of $1.75 a share due on the preferred stock as of July 1 last. It was payable October 2 to stockholders of record the

Crapo
GALVANIZED STEEL
STRAND
Guy and Messenger



ALL the STRENGTH and DURABILITY NEEDS DEMAND

The superior tensile strength that only steel can give .... the ruggedness to withstand severe punishment .... the ability to outlast normal needs ... All these are combined—with outstanding economy—in Crapo Galvanized Guy and Messenger Strand.

Long life and low maintenance costs are characteristic of this time-tested product. Heavy, ductile, tightly-adherent zinc coatings, applied by the Crapo Process, provide lasting protection against corrosion. The inherent strength and endurance of the steel makes for dependable, maintenance-free service.

Crapo Galvanized Steel Strand is readily available in all standard grades and sizes from representative jobbers.

Crapo Galvanized Products also include Crapo HTC-130 and HTC-80 Steel Conductors (Solid and Stranded 3-Wire), Construction Wire, Tie Wire and Ground Wire.

INDIANA STEEL & WIRE CO.
MUNCIE, INDIANA

close of business September 29. This will clear up the requirements on the preferred for the fiscal year, which ended September 30, leaving still undeclared the regular quarterly dividend normally due the beginning of the next fiscal year.

•

General Electric Names Advertising Committee

Announcement has been made by Charles E. Wilson, executive vice-president of the General Electric Co., of the appointment of a new committee to have responsibility for the policies and co-ordination of General Electric advertising.

Chester H. Lang of Schenectady, advertising manager of the company, is chairman of the committee and in this capacity will serve as a member of Mr. Wilson's staff in connection with advertising and publicity matters.

Other members of the committee are B. W. Bullock of Bridgeport, Conn., recently named as advertising manager of the appliance and merchandise department, and H. F. Barnes of Cleveland, Ohio, sales promotion manager of the lamp department.

•

Washer-Ironer Contest Promoted by Kelvinator

Kelvinator washer and ironer dealers can win double money for their window displays this year, for the company has offered to match the cash awards set up by the American Washer and Ironer Manufacturers' Association in cases in which its own dealers featuring Kelvinator laundry equipment qualify for prizes, according to R. W. Poirson, in charge of home laundry equipment sales of the Kelvinator division of Nash-Kelvinator Corp.

The cash awards for the best window displays are in connection with National Washer-Ironer Week, October 14 to 21. Seven cash prizes will be awarded in each group, totaling in all $1,350, plus Kelvinator's equal award to any of its own laundry equipment dealers.

New York Metal Prices

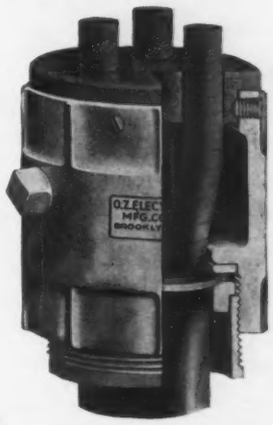
	Oct. 3, '39 Cents per Pound	Sept. 27, '39 Cents per Pound
Copper, electrolytic	12.00*	12.00*
Lead, Am. S. & R. price	5.50	5.50
Antimony	14.00	14.00
Nickel Ingot	35.00	35.00
Zinc, Spot	6.89	6.64
Tin, Straits	57.50	62.00
Aluminum, 99 per cent..	20.00	20.00

* Delivered Connecticut Valley.

The Wizard of O-Z says:

Use O-Z POTHEADS

To terminate and seal cable ends.



A new and complete line of INDOOR TERMINATING POTHEADS for 750 Volt and 2500 Volt service. To accommodate both A.C. and D.C. circuits of one or more cables. Write for BULLETIN 102.

O-Z QUALITY CONDUIT FITTINGS AND SPECIALTIES

CABLE SUPPORTS

INSULATED BUSHINGS

EXPANSION FITTINGS

Above are illustrated some of the many other O-Z products which are listed in our CATALOGUE NO. 4

Representatives in Principal Cities

O. Z. ELECTRICAL MFG. CO., INC.
262 BOND STREET
BROOKLYN · NEW YORK

Field Reports on Business

Electric utilities are going ahead with long-delayed plans for new generating capacity and additions to systems. Orders reaching manufacturers have been at an accelerated rate during recent weeks with some plants now at capacity. Two utilities ordered new generators this week.

NEW YORK

The amount of new construction to be undertaken by the electric utilities and the volume of orders coming into the market indicates that the industry budget for 1940 will be larger than for any year since the depression began. Shops of electrical manufacturers are becoming crowded with several having orders which are taxing their shop capacity. The backlog of orders indicates that production will be at a high rate for many months to come.

Public Service Electric & Gas of New Jersey has ordered a 50,000-kw. unit for its Marion station this week as part of a $7,500,000 program. Georgia Power ordered a 35,000-kw. unit for its Macon plant in a $4,000,000 program. Several other utilities have under consideration new generating capacity.

Business in this area continues to show improvement with even larger volume anticipated. Electrical appliance sales are going well with prospects that there will be little carryover of 1939 models. The vacuum cleaner industry expects sales this year to be 30 per cent above 1938. Great emphasis is being placed on the washer and ironer drive.

While weekly engineering construction awards in September were lower than in 1938, the total for the first nine months was 13 per cent ahead of last year. The high rate of industrial activity has forced many plants to bring into operation less efficient capacity and to plan for new capacity should the rate tend higher, which seems certain in some lines.

PACIFIC COAST

Rapidly increasing prices have stimulated coast buying to the point of local exhaustion of some stocks, such as rubber covered wire. Vigorous efforts are being made to confine purchasing to actual orders and reasonable stocks, and thus avoid the disastrous stock pyramiding of 1937. Flexible steel conductors and rubber covered wire have increased nearly 20 per cent during September, but predictions of decreased building have not yet been realized. The Pacific Gas & Electric Co., is building a new substation in Berkeley mainly for increased residential load. FHA loans in northern California record a 200 per cent increase for 1938 over 1937, and a 15 per cent increase for 1939 so far over same period of 1938.

Bonneville system activity includes low bids of $424,586 aluminum and Kelso-Chehalis-Renton sectors, a low bid of $391,421 from American Bridge Co. for steel towers to carry the same. It is expected that a 50,000 kva. electrical load will be required at the aeronautical laboratory, just assigned to Sunnyvale in the Bay region, where the Langley Field wind tunnels, requiring 24,000 horsepower, will probably be duplicated. Allis-Chalmers was low bidder at $257,500 on a 10,000 kva. steam turbo-electric generator and exciter for the city of Burbank. Barracks and hangars feature current government bids, such as $874,000 for Alameda base seaplane hangars and $984,000 for submarine base barracks at Canal Zone.

NEW ENGLAND

Last week closed a month of unusual activity in buying electrical equipment during which approximately $1,000,000 in turbo-generators and accessories has been booked in this area and an unprecedented rush in buying small motors and control apparatus reported over the last fortnight. Orders are still being received in good measure and industries are sending out many inquiries for a wide range of equipment. Recently machine tool manufacturers placed orders for small motors and control apparatus amounting to more than $70,000 distributed among representatives in this district; last week one manufacturer closed orders totaling more than $5,000 in small motors exclusively for new machines to be built in this district.

Arc welding units are moving rapidly; inquiries are in such number as to raise serious problems in negotiations for quick delivery, according to one manufacturer. A short time ago a 30-outlet welder was placed in a Connecticut shipyard to which a 15 outlet multiple unit will soon be added. Textile plants are planning for considerable equipment consisting of motors and control apparatus. Electric furnace manufacturers are increasing their output and receiving a large volume of inquiries for special steel treating types. Belmont, Mass., has prepared plans for continuing work of placing electric light wires underground at an estimated cost of $100,000. New construction projects are in good volume and industrial lighting is gaining.

Merchandising is moving ahead; refrigerator and range sales forged to new year's high in the Vermont area last week.

CHICAGO

Several industries registered one of the sharpest weekly gains on record as the wide and general buying movement continued throughout this area. The rate of steel operations in the Chicago district continued to rise sensationally, with one large company using 17 out of 23 available furnaces.

Rapid expansion of new equipment purchases by railroads is contributing greatly to increased industrial production. Chicago, Milwaukee, St. Paul and Pacific R. R. will spend $10,000,000 for new equipment while the Illinois Central placed orders for 2,500 freight cars to cost $7,000,000. Three other western roads have ordered a total of 3,500 cars.

Inquiry reveals a considerable number of companies preparing for expansion of facilities. Buying of central station equipment goes forward at an encouraging rate as utility expansion proceeds. Commonwealth Edison Co. is building a new substation to cost approximately $500,000 including switchgear, transformers and other equipment. Wisconsin Electric Power Co. plans to start work soon on a $4,000,000 expansion program at its Milwaukee plant.

Manufacturers report a steady increase in inquiries from utilities and large industrial plants with some sizeable orders in prospect for the near future.

GEARED

to serve alertly a huge and ever-growing industry...

An important reason why

Electrical World makes Good Advertising Pay

Bagging an Advertising Account Is One Thing... Holding It...Year after Year after Year...that's something a whole lot different...

Many of our industry's most successful concerns have been regular Electrical World advertisers for twenty, thirty, forty years. ★ Some go back even further; several have been consistent space users for more than half a century. That's a matter of very real pride to Electrical World and—as we have frequently observed—to these advertising oldtimers, too. ★ What hotter clue could you follow in the quest for proof of advertising resultfulness?

FOR INSTANCE:

☆ One of the WORLD's oldest, largest, most consistent advertisers is the OKONITE COMPANY. Its remarkable space record goes back well past the fifty-year mark, a fact it—and ELECTRICAL WORLD, may regard with considerable satisfaction. For surely both of us had to have plenty on the ball to roll up that kind of performance record.

W.K.Vanderpoel, vice-president of the Okonite Company, explains it this way:

"We have always believed in sound advertising in sound publications and have consistently done much of it. Our experience with Electrical World has been most satisfactory and we feel sure that our business has been helped by using it as a medium for giving information about our many products."

☆ "MEGGER" INSTRUMENTS are known wherever electricity is known, an accomplishment due in real part to the policy of persistent advertising adhered to throughout the entire lifetime of the James G. Biddle Company of Philadelphia.

The business was started in 1895 and in the following year it launched its advertising career, in ELECTRICAL WORLD. Space has been continued—*without interruption*—for forty-four years. Mr. Biddle, founder of the company, writes as follows:

"Some one has said very aptly that 'Actions speak louder than words.' Well, if that be true, it may be answering this question adequately to state as a rather significant fact that our organization began using your publication 44 years ago and has been 'at it' ever since.

"In the last analysis, my personal opinion of business paper advertising agrees very closely with the attitude of an aggressive farmer in respect to fertilizer. I believe that judicious publicity is definitely worth while."

☆ BAKELITE is a household word today... thirty years ago it was a newly discovered material struggling for identity. The very first advertisement of "Bakelite—the Synthetic Insulating Substance" appeared in ELECTRICAL WORLD, issue of November 3, 1910. The electrical industry has gone far since then, Bakelite and ELECTRICAL WORLD with it. And today Bakelite is still a WORLD advertiser.

ELECTRICAL WORLD

A McGRAW-HILL PUBLICATION
330 WEST 42nd STREET, NEW YORK, N. Y.

No. 1 of a series of factual messages designed to demonstrate that GOOD ADVERTISING *in a leading business publication will invariably produce worth-while results*

ROLLER-SMITH

4″

INSTRUMENTS

are just the right size for small switchboards, panels, "built-in" equipments and many other applications. They are available in surface and flush cases and may now be had in the new *square cases*, as illustrated.

The line includes both *direct and alternating current* ammeters, microammeters, milliammeters, voltmeters, millivoltmeters, single *and polyphase* wattmeters, frequency meters and pyrometers.

Long scales, exceptionally high accuracy and illuminated dials (if ordered) are some of the outstanding features of these instruments. Complete listings and technical details are given in Catalog *D-48-a*, which will gladly be sent on request.

A companion line of 3″ instruments is shown in this same Catalog. The 3″ instruments are a little smaller than the 4″ ones but have the same high qualities.

ROLLER-SMITH COMPANY
Electrical Measuring and Protective Apparatus

MAIN OFFICE AND WORKS:
BETHLEHEM, PA., U. S. A.

Sales Agencies in Principal Cities in United States and Canada

Sales Opportunities

WASHINGTON, D. C.—Potomac Electric Power Co. has plans under way for three new indoor-type power substations on local sites at 1262 Kearney Street, N. E., 2006 Bunker Hill Road, N. E., and 2626 South Dakota Avenue, N. E., respectively, and will begin work soon. Stations will be used for network transfer service, with extensions in primary lines for increased service.

HUNTINGTON, IND.—Board of Public Works has surveys and estimates of cost under consideration for expansion and improvements in municipal electric power plant, including installation of new generating unit and accessories; reconditioning and improving present turbine unit, boilers and miscellaneous apparatus; installation of new electric-operated pumping machinery and auxiliary equipment. Proposed to arrange call for bids in near future. Lennox & Matthews, Architects' and Builders' Building, Indianapolis, Ind., are consulting engineers.

CANTON, OHIO—Republic Steel Corp., Republic Building, Cleveland, Ohio, plans installation of new 50-ton capacity electric furnace at branch mill at Canton, as well as other electric equipment, including motors and controls, regulators and conveyors. Similar expansion will be carried out at mill at Buffalo, N. Y., where an electric furnace unit now at Canton mill will be transferred and additional electrical apparatus installed. This is part of an expansion and improvement program authorized by company at different mills throughout country, including plants at Cleveland, Warren and Youngstown, Ohio, and other points. Project will include installation of new coal-handling equipment at southern mining properties. A fund of $3,000,000 has been authorized for entire program.

DENVER, COLO.—Bureau of Reclamation, Denver, receives bids until November 16 for main and auxiliary control equipment, automatic oscillographs, power control apparatus, battery distribution switchboard, air circuit breakers and accessory equipment for control of generating units A-1 and A-2 at Boulder power plant, Boulder Canyon project, Arizona-California-Nevada. All equipment will be installed by Government (Specifications 878).

SEAFORD, DEL.—E. I. duPont deNemours & Co., Rayon Division, duPont Building, Wilmington, Del., plans installation of motors and controls, regulators, conveyors and other equipment in new addition to Nylon fiber mill at Seaford, forming the second production unit at that place; first unit is now in course of construction and is scheduled for completion by close of year. Expansion will include another main mill, totaling over 200,000 square feet of floor space, designed to increase output about 25 per cent. An air-conditioning system will be installed. Cost reported over $4,000,000, including equipment. Proposed to proceed with erection as soon as present unit is completed.

MCGREGOR, IOWA—Town Council has plans maturing for proposed new municipal power plant and has called special election on October 12, to vote bonds for $120,000 for project. Proposed to ask bids for equipment soon. Young & Stanley, Inc., Muscatine, Iowa, is consulting engineer.

RAHWAY, N. J.—Merck & Co., Inc., Lincoln Avenue, plans installation of motors and controls, regulators, conveyors and other equipment in new additions to local chemical-manufacturing plant, consisting of extension of about 17,000 square feet of floor space to main production division, and several other units for technical service. Work will be placed under way soon. Cost estimated close to $300,000.

MOSCOW, IOWA—First Iowa Hydro-Electric Cooperative, Inc., Moscow (Muscatine County), Harry Strong, general manager, recently organized by Mr. Strong and associates, has plans under way for new hydroelectric generating station on Cedar River, near Moscow, including power dam, artificial lake, power station of about 20,000-horsepower initial capacity, transmission and distributing lines, and auxiliary structures. Entire project is reported to cost about $3,000,000. Application has been made for permission.

HASTINGS, MICH.—Consumers Power Co., Jackson, Mich., has approved plans for new service and operating building at Hastings, and will proceed with erection at once. Cost reported in excess of $75,000, with equipment.

NEW LONDON, IOWA—City Council receives bids until October 18 for extensions and improvements in municipal electric power plant, including installation of equipment. New coal-handling machinery will be purchased. Young & Stanley, Inc., Muscatine, Iowa, is consulting engineer.

LOS ANGELES, CALIF.—Paramount Pictures, Inc., Paramount Building, New York, N. Y., and 5451 Marathon Avenue, Los Angeles, is placing plans in progress for proposed new studios on 150-acre tract of land bounded by Pico and National Boulevards, Overland and Kelton Avenues, Los Angeles, previously referred to in these columns. Installation will include power substation unit and complete electrical utilities for self-contained operating center, motors and controls, coneyors, regulators, high-power and other lighting facilities, flood lighting, signal and fire alarm systems, and other electrical facilities. Ultimate project will include a series of 26 sound stages, with total floor area of 500,000 square feet, mechanical and electrical shops, administration building and other structures. It is estimated that 48 to 56 months will be required for completion, with estimated cost of $10,000,000 to $12,000,000. William L. Pereira, 221 North LaSalle Street, Chicago, architect, has been engaged to supervise design and construction.

SHELBY, N. C.—City Council plans extensions and modernization in municipal electrical distribution system, with installation of new equipment. Bids will be asked soon.

GARRETT, IND.—Board of Public Works is arranging early call for bids for extensions and improvements in municipal power plant and waterworks pumping station, including installation of additional equipment. Bevington-Williams, Inc., Indiana Pythian Building, Indianapolis, Ind., is consulting engineer.

•

Get Physical Examination

All operating department employees of Florida Power Corp. will be given physical examinations semi-annually under a plan inaugurated by the company. In addition, employees over 45 and those who have never had a company examination will be examined.

Recent Rate Changes

CENTRAL NEW YORK POWER CORP. has announced a new rate schedule effective in the Oswego and Fulton areas, according to an announcement by Resident Manager Carl F. Mowry of the Oswego office. The new rate, providing it is approved by the state Public Service Commission, will become effective October 15. The new residential and farm rate, applying throughout the territory affected, is stated net as follows: first 12 kw.-hr. or less per month, $.95 net; next 49 kw.-hr., per kw.-hr., 4.8 cents net; next 140 kw.-hr., per kilowatt-hour, 2.5 net; all over 200 kw.-hr. per kilowatt-hour 1.5 net. Present rates, for cities of Oswego and Fulton, first 12 kw.-hr., or less per month, $1 net; next 28 kw.-hr. per kilowatt-hour, 6 cents net; next 160 kw.-hr., per kilowatt-hour, 3 cents net; all over 200 kw.-hr. per kilowatt-hour, 2 cents net. Present rate for farm and rural residence, first 25 kw.-hr., per kilowatt-hour, 8 cents net; next 25 kw.-hr., per kilowatt-hour 6 cents net, all over 50 kw.-hr., per kilowatt-hour, 3 cents net. 1.5 cents per kilowatt-hour for all over 200 kw.-hr. The annual saving in the Oswego-Fulton area is placed at $35,000.

WOODVILLE ELECTRIC LIGHT & POWER CO., INC., Woodville, N. Y., has filed a revision of its electric rates with the state Public Service Commission which is estimated to save consumers about $500 per year. The commission permitted the revisions to become effective October 5.

OLD FORGE ELECTRIC CORP., Old Forge, N. Y., has filed a revision of electric rates with the state Public Service Commission which is estimated to save some customers of the company about $830 annually. The commission permitted the changes to become effective October 1.

•

Free Electricity Ends In Pennsylvania Town

Two decades ago M. L. Ruddy of Steelville, Pa., constructed a hydroelectric plant for his own use. Soon he found that the plant furnished more electricity than he could use. He invited his neighbors to use the current. Six of the town's seven families enjoyed the free current.

When Mr. Ruddy died he willed the plant to Charles Evans, who continued the custom until the community's gradually increasing use of electricity overtaxed the generator. Mr. Evans then began to buy current from a power company—and his neighbors followed suit, and thus ended two decades of free electricity.

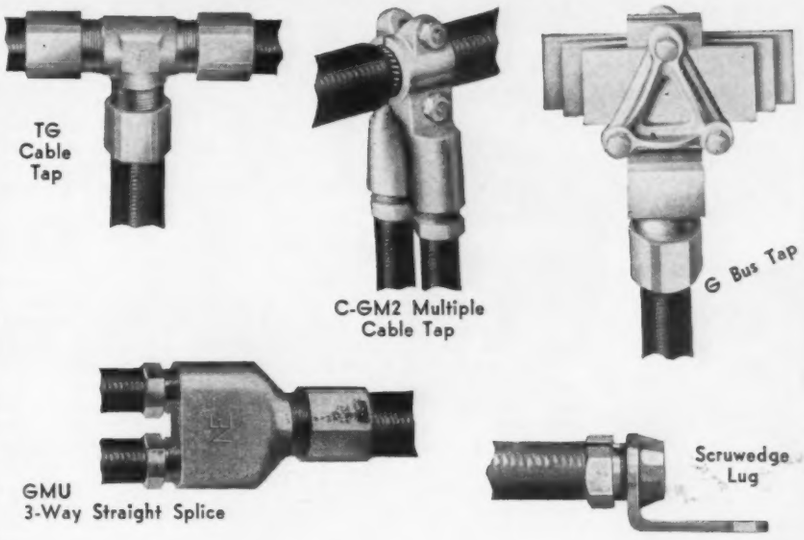
•

WPA Expenditures

The WPA announced that through June 30, 1939, electrical machinery, apparatus and supplies purchased for the projects totaled $21,490,654, on a cumulative basis of which federal funds totaled $8,177,623 and sponsors' funds totaled $13,313,031.

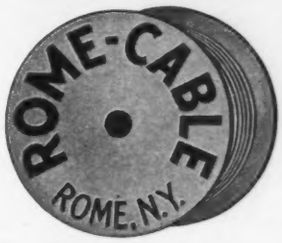
NATIONAL PRESSURE CONNECTORS

FOR EVERY REQUIREMENT



Write For Catalog

National Electric
PRODUCTS CORPORATION
Pittsburgh, Pa.



Hot Rolled Copper Rods • Bare and Tinned Strand
Bare and Tinned Copper Wire
(In Rounds, Flats and Squares)
URC Weatherproof Wire
Cotton, Paper and Asbestos Magnet Wire
(In Rounds, Flats and Squares)
Rubber Insulated Wires and Cords
Lead Covered Cables • Multiconductor Power Cables
Network, Service Entrance, Control Cables

ROME-60
ROME CABLE CORP. ROME, N.Y.

That New, Tough, 60% Jacketed, Heavy Duty Portable Cable

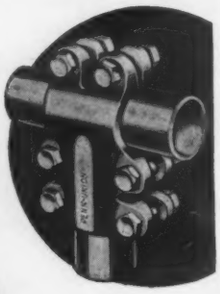
ROME CABLE
CORPORATION
ROME, N.Y.
SALES OFFICES:
New York Chicago Cleveland Pittsburgh Detroit
Boston Richmond Philadelphia Los Angeles

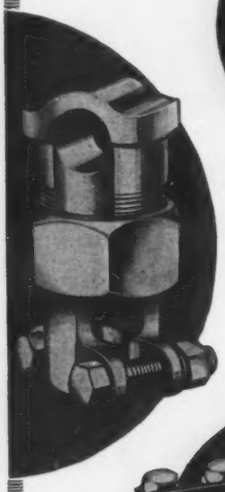
ALL Kinds of Fittings—

for every type of electrical connection. For any combination of tube, bar, cable, or wire.

More than 6,200 items.

Clamp Type Tees in all sizes. High copper alloy; machined contact surfaces.





Self-Locking Tees that hold permanently tight. With and without extension.

Reducer Connectors for different sizes of cable. High copper with Everdur bolts, nuts, lockwashers.

You will be interested in the many NEW and IMPROVED fittings in the Penn-Union Catalog. Write for it.

Every item thoroughly tested, and Dependable.

Preferred by leading Utilities and "Industrials."

Sold by leading jobbers

PENN-UNION ELECTRIC CORPORATION

ERIE, PA.

You'll find it in the *complete* line

PENN-UNION

Conductor Fittings

Municipal Plants

HARRISON, ARK.—Following a recent conference between Frank M. Wilkes, superintendent of the Arkansas Power & Light Co. and city officials, Mayor L. C. Holt stated that a plan may be advanced by the mayor and city council for the purchase and operation of an entirely new electric power and lighting plant, to be municipally operated. The mayor estimates that a municipal plant could be installed for $200,000. He stated that the franchise of the utility expired in 1937, and that it now operates from year to year upon a permit for the State Utilities Commission.

VENTURA, CALIF.—General obligation bonds amounting to $1,200,000 for the purpose of constructing or acquiring an electric distribution system will be passed upon by the voters at the November 7 election. On the same ballot will be a charter amendment authorizing the issuance of revenue bonds to engage in utility operations. The general obligation bonds will require a two-thirds majority to pass; the charter amendment a simple majority. The city is now served by the Southern California Edison Co.

BEMIDJI, MINN.—City Council voted 10 to 1 recently to grant an electric franchise to the Interstate Power Co., thus obviating a campaign for municipal ownership of the utility. The fifteen-year franchise provides the city may negotiate at the end of any five-year period for a revision in rates. The company has been operating for two years without a franchise, and for four years each city election has been marked by a controversy over municipal ownership of the electric generating and distributing system.

CARROLLTON, MO.—Judge James S. Rooney in the Circuit Court ruled against the Kansas City Power & Light Co. in its injunction suit to restrain the city from erecting a $200,000 municipal water and light plant. Judge Rooney's ruling dismissed a temporary injunction granted in July. Last September the city voted a bond issue to raise 65 per cent of the total cost of the municipal plant. A PWA grant provides for the remainder of the cost. In contesting the right of the city to erect such a plant, the utility company asserted the move was "not in accordance with the original franchise granted twenty years ago." Work on the new plant is expected to start soon.

BAYARD, NEB.—Citizens have voted 280 to 141 to condemn the Western Public Service Company's property in this city and organize a municipally owned electric distribution system. The city voted last October to condemn the property but the election was set aside after the company secured an injunction on charges the property was improperly listed on the ballot. Floyd Wright, special attorney for the city, stated the state supreme court will appoint three district judges to set the valuation on the property.

GALAX, VA.—Appalachian Electric Power Co. and a group of citizens on September 13 won a victory in the Virginia Supreme Court of Appeals where they were attempting to have nullified an election which last year authorized a $158,000 bond issue for a municipal power project. The deciding point of the case hinged on the fact that the town is situated in both Carroll and Grayson counties, and that the electoral board of Carroll County alone acted in the election, whereas the electoral board of Grayson County also should have acted.

BLACKBURN CONNECTORS Save TIME and MATERIAL

No loose nut to drop. Hand is free to work faster. No parts to lose.

Specify Blackburn ONE-PIECE CONNECTORS

JASPER BLACKBURN PRODUCTS CORP.

Main and Clinton Sts. ST. LOUIS, MO.

GUARD AGAINST CURRENT DIVERSION with **STAR METER SEAL**

Saves many thousands of dollars annually by elimination of tampering and theft of current. Seals all types CS meters effectively and permanently. Cannot be removed without destroying or mutilating. SEND FOR SAMPLE.

The **STAR PORCELAIN COMPANY**

51 Muirhead Ave. Trenton, N. J.

CAMBRIDGE, WIS.—State Public Service Commission, in accordance with a state Supreme Court ruling, dismissed recently the action taken by the village to acquire the local electric plant of the Wisconsin Power & Light Co. in a recent appeal by the company, the court held that the Cambridge electric plant included not only the company property in the village, but high lines running to Lake Ripley and the unincorporated village of London. With this additional property included in the plant, the village contained only 40 per cent of the total property and lost its right to acquire the plant because the acquisition law gives the right of acquisition only to the municipality which has a major part of the electric plant within its limits.

CUMBERLAND, WIS.—Attempts of the Wisconsin Hydro-Electric Co. and W. T. Doar of Cumberland, a taxpayer, to prevent the city from constructing a Diesel electric generating plant have been ruled out by Circuit Judge Henry P. Hughes, Oshkosh. The Wisconsin Public Service Commission had granted the city permission to construct the plant after the city failed to renew its contract with the Wisconsin Hydro-Electric Co., which had furnished energy to the city's distributing plant for more than fifteen years. The company and Mr. Doar appealed to circuit court from the commission's ruling.

•

Chile Organizes Agency to Sponsor Utility Plan

Announcement has been made by the Corporacion de Fomento, a new state corporation to promote national economic development in Chile, of a fiscal plan for a five-year development of domestic hydro-electric resources, the American Commercial Attaché at Santiago has reported to the Department of Commerce.

The plan contemplates loans to small electric power companies through the Industrial Credit Institute up to a grand total of 10,000,000 pesos, of which 3,500,000 pesos will be made available this year. (A peso equals 4 cents.) Formation of regional stock companies, in which the corporation will subscribe 200,000,000 pesos capital in five years at the rate of 40,000,000 pesos a year, and private parties will subscribe 180,000,000 pesos.

•

Complete Sales Training

Seven hundred and thirty-three Kelvinator selling men, located in all parts of the United States, comprise the second graduating class of the Kelvinator National Salesmen's Institute, now receiving diplomas, according to an announcement by Sidney Edlund, president of the institute. The institute was launched a year ago by George W. Mason, president of Nash-Kelvinator Corp., as an outgrowth of the National Salesmen's Crusade, the "Sales Mean Jobs" movement which he originated in the spring of 1938.

WIDE RANGE OF WIRE CAPACITIES MAKES POSSIBLE QUICK, SAFE, STRONG CONNECTIONS AT LOWER COST . . . .

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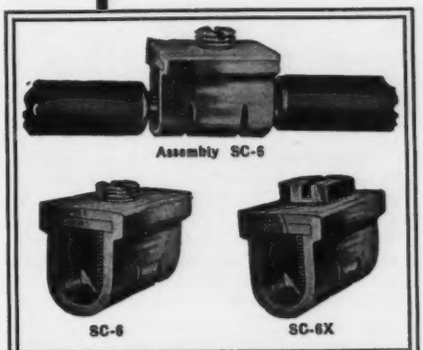
Wedge Grip

CONNECTORS



No need to twist or solder service wires if you use Sherman Wedge-Grip Connectors. These connectors were created by the modern Sherman method after careful research and experiment. All weaknesses of previous types have been eliminated. Workmen and management alike prefer Sherman Wedge-Grip Connectors because of time saving and convenience. A turn of the screwdriver and the job is done—you have a smooth, streamlined joint. Easily disconnected and can be used over and over again which is an advantage especially in service entrance work. Send for a sample and try it in actual use.

● For service entrance and all small wire connections. Tough bronze, screw peened in to prevent loss, V-shaped corrugations to insure tight grip, copper body for highest conductivity. Four sizes for No. 12 to No. 2 stranded wire. Two types of screw—hexagon or plain headless. Send for Bulletin No. 22.

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Pittsfield, Mass.

Lists Construction Contracts Approved

Announcement has been made by the Rural Electrification Administration that the following construction contracts have been approved for projects in various states:

ARKANSAS—Ozark Rural Electric Cooperative Corp., Fayetteville, E. H. Looney, supt., and engineer, contract to Midland Constructors, Inc., Chicago, for building another section of project, 68 miles of line, 160 members; bid $47,132.

COLORADO—Union Rural Electric Association, Inc., Brighton, Jess R. Rahn, supt., and E. C. Porter, engineer, contract to E. A. Reither, Aitken, Minn., 271 miles, 657 members; bid $164,339.

FLORIDA—Clay Electric Co-operative Assn., Inc., Keystone Heights, Elmer E. Theis, supt., and A. P. Michaels, Orlando, Fla., engineer, contract to Harvey & Quina, Pensacola, another section of project, 249 miles of line, 548 members; bid $124,942. West Florida Electric Co-operative Assn., Inc., Graceville, Claude H. Smith, supt., and E. P. McLean, Moultrie, Ga., engineer, contract to Harvey & Quina Co., Pensacola, another section of project, 265 miles of line, 541 members; bid $124,068.

GEORGIA—Cobb County Rural Electric Membership Corp., Marietta, Carl E. Hamby, supt., and J. B. McCrary Engineering Corp., engineer, contract to H. B. Nelson Construction Co., Atlanta, Ga., another section of project, 129 miles of line, 420 members; bid $74,574.

IDAHO—Clearwater Valley Light & Power Assn., Lewiston, A. R. Mushlitz, supt., and T. C. Smith, engineer, contract to O. A. Carlson Electric Co., Seattle, Wash., another section of project, 105 miles of line, 286 members; bid $88,038.

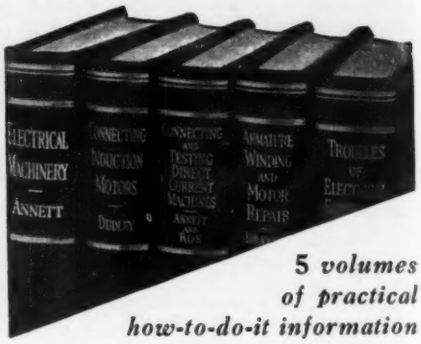
ILLINOIS—Illini Electric Co-operative, Champaign, Vernon C. Green, supt., and Caldwell Engineering Co., Jacksonville, engineer, contract to Cater Construction Co., Kansas City, Mo., another section of project, 520 miles of line; bid $372,855. Norris Electric Co-operative, Newton, Russell Harrison, supt., and Laramore and Douglass, engineer, contract to the Miller Construction Co., Indianapolis, entire project, 215 miles of line, 537 members; bid $160,412.

INDIANA—Tipmont Rural Electric Membership Corp., Linden, Verl H. Hiatt, supt., and Putnam and Woolpert, engineer, contract to Honold and LePage, Sheboygan, Wis., another section of project, 180 miles of line, 505 members; bid $134,690.

IOWA—Winnebago Rural Electric Co-operative Assn., Thompson, Glenn Bergland, Supt., and Stanley Engineering Co., Muscatine, Iowa, engineer, contract to Hoak Construction Co., Des Moines, entire project, 268 miles of line, 580 members; bid $125,024. Osceola Electric Co-operative, Inc., Sibley, William Roberts, supt., and Buell and Winter, Sioux City, Iowa, engineer, contract to Acme Construction Co., and Wunderlich, St. Paul, Minn., entire project, 180 miles of line, 335 members; bid $118,355. Allamakee-Clayton Electric Co-operative, Inc., Postville, Kermit M. James, supt., and A. W. Grubb, Vinton, Iowa, engineer, contract to E. W. Wylie, Inc., St. Paul, Minn., entire project, 240 miles of line, 502 members; bid $161,621.

KENTUCKY—Harrison County Rural Electric Co-operative Corp., Cynthiana, G. L. Bridwell, supt., and Ray W. Chanaberry, Louisville, engineer, contract to the T. W. Owens Co., Louisville, another section of

Every phase of electrical maintenance and repair work covered in this NEW Library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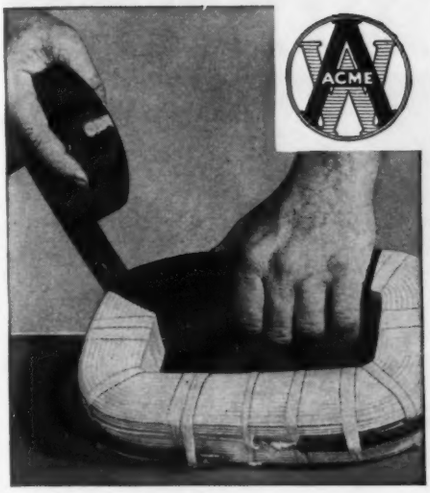

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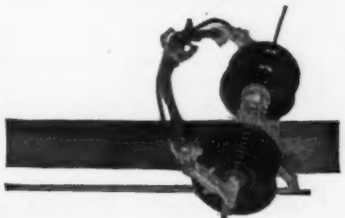

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project, 232 miles of line, 513 members; bid $132,052. South Kentucky Rural Electric Co-operative Corp., Monticello, G. E. Roberts, supt., and P. M. Sullivan, Gallatin, Tenn., engineer, contract to Nile E. Yearwood, Nashville, Tenn., for building entire project, 218 miles of line, 567 members; bid $128,523.

LOUISIANA—Claiborne Electric Co-operative, Inc., Homer, W. M. Rainach, supt., and William G. Morrison, Dallas, Tex., engineer, contract to L. O. Brayton, Dyersburg, Tenn., entire project, 231 miles of line, 450 members; bid $111,481.

MINNESOTA—Stevens-Big Stone Co-operative Power Assn., Benson, Victor Hansen, supt., contract to E. W. Wylie, Inc., St. Paul, entire project, 227 miles of line, 347 members; bid $173,373.

MISSISSIPPI—Singing River Electric Power Association, Lucedale, Miss., A. P. Lavallett, supt., and L. C. Winterton, Pascapoula, engineer, contract to W. L. Coston & Sons., Bessemer, Ala., entire project, 290 miles of line, 838 members; bid $165,-045.

MISSOURI—Northwest Missouri Electric Co-operative, Savannah, J. Ray Lambright, supt., and K. R. Brown, Des Moines, Iowa, engineer, contract to F. A. Goll Co., Milwaukee, Wis., another section of project, 219 miles of line, 385 members; bid $143,-468. Black River Electric Co-operative, Annapolis, Ray Brown, supt., and E. T. Archer & Co., Kansas City, Mo., engineer, contract to A. W. Mosley, Kansas City, entire project, 171 miles of line, 511 members; bid $141,855.

NORTH DAKOTA—Walsh Rural Electric Co-operative, Inc., Grafton, N. D., Fred A. Karnick, supt., contract to Zontelli Brothers, Ironton, Minn., entire project, 250 miles of line, 517 members; bid $159,867.

OKLAHOMA—Kiwash Electric Co-operative, Inc., Cordell, Ripley Greenhaw, supt., and Guernsey and Benson, Cherokee, Okla., engineer, contract to Cain and Cain, Ft. Worth, Tex., entire project 275 miles of line, 674 members; bid $155,895. East Central Oklahoma Electric Co-operative, Inc., Okmulgee, D. A. Turinsky, supt., and Midwestern Engineering & Construction Co., Tulsa, engineer, contract to Walco Engineering & Construction Co., Tulsa, entire project, 344 miles of line, 737 members; bid $195,708.

PENNSYLVANIA—Central Electric Co-operative, Inc., Parkers Landing, Donald Edge, manager, and Gibbs & Hill, Inc., New York, N. Y., engineer, contract to Miller-Baxter, Inc., Indianapolis, Ind., another section of project, 267 miles of line, 1,145 members; bid $215,766. Bedford Rural Electric Co-op., Inc., Bedford, A. B. Cole, supt., and Gibbs & Hill, New York, engineer, contract to M. F. Arrington, Marriotsville, Md., 210 miles, 862 members; bid $172,546.

SOUTH CAROLINA—State Rural Electrification Authority, Columbia, S. C., U. X. Cullum, engineer, contracts to Ledbetter and Johnson, Rome, Ga., and Wannemaker and Wells, and Boyle Road and Bridge Co., 278 miles of line, 1,049 members and 478 miles of line, 1,615 members; bids $156,672 and $268,869, respectively. Laurens Electric Co-operative, Inc., Laurens, Henry M. Faris, supt., and B. O. Vannort, Asheboro, N. C., engineer, contract to the Perkins-Barnes Construction Co., Inc., Blackstone, Va., for building entire project, 264 miles of line, 900 members; bid $169,-532.

TEXAS—Deaf Smith County Electric Co-operative, Inc., Hereford, Tex., H. V. Hennen, supt., contract to J. E. Morgan & Sons, El Paso, Tex., another section of project, 224 miles of line, 380 members; bid $103,580. Stamford Electric Co-opera-

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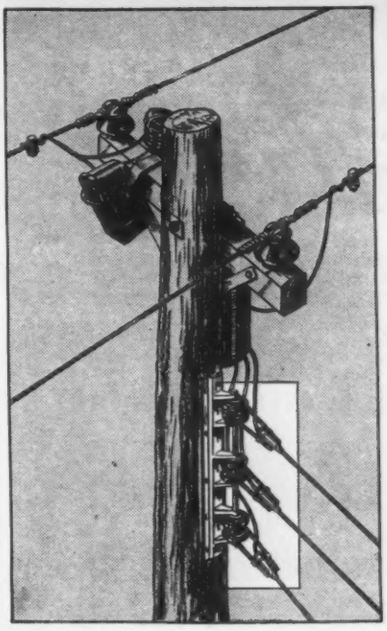

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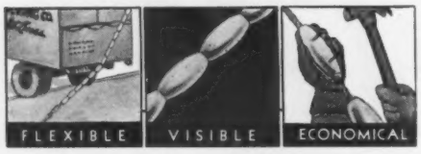

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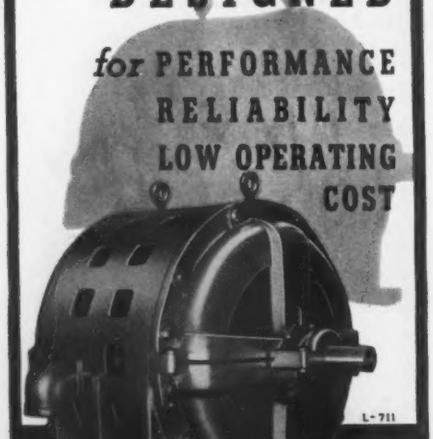

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tive, Inc., Stamford, Tex., Henry L. Osment, supt., and William G. Morrison, Dallas, engineer, contract to R. W. McKinney, Nacogdoches, Tex., entire project, 212 miles of line, 400 members; bid $101,442.

WISCONSIN—Chippewa Valley Electric Co-operative, Cornell, Wis., Raymond L. Cleaves, supt., and Banister Engineering Co., St. Paul, Minn., engineer, contract to Zentelli Brothers, Ironton, Minn., another section, 187 miles of line, 478 members; bid $118,972. Polk-Burnett Electric Co-operative, Balsam Lake, Wayne F. Kelly, supt., and Wisconsin Development Authority, Madison, engineer, contract to E. W. Wylie, Inc., St. Paul, Minn., another section of project, 201 miles of line, 450 members; bid $138,324. Adams-Marquette Electric Co-operative, Friendship, James G. Joyce, supt., and Wisconsin Development Authority, Madison, engineer, contract to Palmer Construction Co., Reedsburg, Wis., entire project, 224 miles of line, 473 members; bid $157,213.

KANSAS—Nemaha-Marshall Electric Co-operative Assn., Inc., Axtell, Reed W. Compton, supt., and Paulette and Wilson, Topeka, Kans., engineer, contract to Cater Construction Co., Kansas City, Mo., entire project, 387 miles of line, 615 members; bid $243,300.

•

$301,104 Profit Reported by Italian Superpower

Italian Superpower Corp. reports total assets of $31,956,090 as of June 30, including $29,347,368 investments at cost or declared value, and with a market value of $24,277,663, based, for the majority of holdings, on closing prices on the Italian Stock Exchanges on June 30, converted into dollars at 5¼ cents a lira.

Net loss for the June quarter was $266,170, including $141,930 loss on sales of investments, against losses of $507,698 and $359,340, respectively, in the 1938 period.

For the twelve months ended on June 30 the net profit was $301,104, including loss of $174,469 on sales of securities, in contrast to a loss of $662,119, including a $363,758 loss on sales of securities, in the preceding year.

•

Records Millionth Visitor

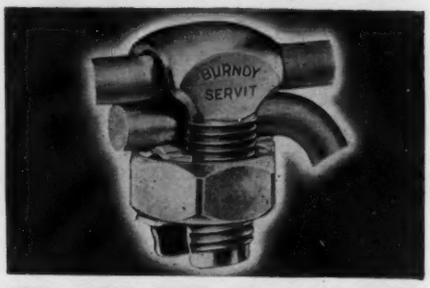
Westinghouse Electric & Manufacturing Co. states that more than a million visitors have witnessed its dish-washing contest. Mrs. George M. Ferris, Chevy Chase, Md., the millionth visitor, was presented with a Westinghouse dish-washer.

•

Oklahoma Appliance Sales

Oklahoma Gas & Electric reports for the first seven months this year sales of 9,057 refrigerators, 13,110 radios, 5,196 washers, 3,437 vacuum cleaners, 830 cookers, 6,231 reflector lamps, 406 attic fans, 232 room coolers and 18,561 small appliances.

BURNDY



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EHFA Signs Appliance and Wiring Contracts

Electric Home and Farm Authority has announced that contracts had been closed with the Co-Op Electric Co. of Osage, Iowa, Saint Ansgar, Iowa; Sequachee Valley Electric Co-operative, South Pittsburg, Tenn.; Jones County Electric Power Assn., Laurel, Miss., and the Eastern Nebraska Public Power District, Tecumseh, Neb. Contract provides for co-operation in financing electric appliance sales.

Announcement was also made that EHFA contracts had been closed with the Co-Op Electric Co. of Osage, Iowa, Saint Ansgar, Iowa, and the Renville-Sibley Co-operative Power Association, Fairfax, Minn. Contracts provide for co-operation in financing the wiring and rewiring of existing homes and farms.

•

High Point Signs Rate Contract With Utility

High Point, N. C., has signed a contract with the Duke Power Co. for a new rate on electric energy it purchases for resale which officials said will result in a saving of more than 20 per cent. The agreement ended, at least temporarily, a four-year quarrel between the city and the power company over a contract.

The new contract, however, states that it shall not prejudice existing claims and litigation. This clause is of particular significance in view of a suit pending in federal court in which the city asks a judgment of $124,000 against the power company for alleged overcharges. In the suit, which is scheduled to be tried this fall, the city contends the rate the power company has charged since the termination of an old contract, on March 1, 1935, is higher than that charged other cities for a similar service and in excess of that authorized by the State Utilities Commission.

•

Electrification Census

The Bureau of Census advised that early next year a census will be taken to ascertain the horsepower (electrical or otherwise) used in the various industries in 1939. These statistics were included in the Census of Manufacturers for 1929, but were omitted from subsequent issues of the biennial census. This will be an inquiry on power equipment similar to the one contained in the 1929 schedule. The census will be taken next year and will be available some time in 1941.

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LETTERS TO THE EDITOR

Linear Distances From Automobile Speedometer

To the Editor of ELECTRICAL WORLD:

The article shown on page 66 of the August 26 issue, "Distance Meter Estimates Lines," has attracted my attention and the following is submitted for the convenience of those who have no magnetic counter, as outlined in this article:

"Linear distances can be read with sufficient accuracy for certain types of work from an automobile speedometer. This is done by carefully estimating the distance between the figures on the marker showing the tenths of miles, thereby obtaining a reading very close to hundredths of a mile or 52.8 feet. On short distances of 1/10 mile or less there may be a slight percentage of error, perhaps one or two hundredths, or five to ten feet in 52.8 feet, but where greater distances are involved the actual error would be no larger, although the per cent of error would be materially reduced so that it becomes negligible. A conversion table from which any reading from 0.01 to 0.99 miles can be ascertained is easily prepared.

"One man in a car can read and record by this method such data as are outlined in the article above mentioned."

JOHN B. STUARD,
District Engineer
New England Tel. & Tel. Co.,
Bangor, Maine.

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Fluorescent Lighting Versus Air Conditioning

To the Editor of ELECTRICAL WORLD:

In your issue of July 29, 1939, George J. Taylor of the General Electric Company makes a very interesting presentation of the results to be obtained by using fluorescent lighting to reduce air-conditioning loads.

We all welcome this new lighting tool as a means of securing higher levels of illumination with a smaller heat load than would be present with other types of lighting. However, with some of the costs given, I fear the industrial customers will question whether air conditioning is a desirable investment.

Under "Basis of Savings Estimates" the author says: "The actual cost of installed equipment may vary between $600 and $800 per ton, considering initial installation." Is he talking about the cost of a ton of air-conditioning capacity or the cost of the lighting equipment that would require a ton of air-conditioning capacity for heat removal? I believe that most readers will take these high figures as the air-conditioning cost and then be unable to reconcile them with the next statement: "If the system can be reduced to smaller tonnage, savings may be effected of from $150 to $300 per ton."

In figuring operating costs an equivalent of 2,000 hours full load operation per year is assumed. This may be true for the particular department used as an example, which I understand operates 24 hours per day. It will not hold for industries having shorter work day and will also vary with geographical location and other factors.

I am reliably informed that the cost of electricity and water for the installation cited is near 2 cents per ton-hour. As these are practically the only operating costs that can be credited to the reduction in tonnage, the 3 to 5 cents used is unreasonably high. We must remember that the average industry purchasing a sizable block of power will purchase the additional energy needed for air conditioning at a low increment rate.

Let us give proper credit to fluorescent lighting, but not inflate that credit to the detriment of air conditioning by generalizations regarding air-conditioning costs. Each case requires special study.

EARLE W. GRAY, Commercial Dept.
In Charge of Air Conditioning,
Oklahoma Gas & Electric Co.
Oklahoma City, Okla.

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Commercialism in National Electrical Code Making

To the Editor of ELECTRICAL WORLD:

I refer to your editorial in the August 26 issue of ELECTRICAL WORLD. I agree heartily with most of your conclusions, especially with statements as "Certainly a code ought to be made solely in the public interest," and "Certainly safety should not be compromised by commercialism."

But this line of thought goes into reverse in the last paragraph with the statement, "We agree it is no reason for code recognition that a new product will decrease the price or provide for more labor or for greater sales."

The code authority has assumed a great social obligation in setting up safeguards for the use of electricity because such use affects almost every detail of our present-day life. The primary aim of the code is safety, but does not the responsibility for setting up safety requirements inherently carry similar obligations with respect to cost? It is generally conceded that

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our standard of living and social well-being has been and will continue to be improved by increasing the use of electricity. Increase in use cannot be separated from price. Consequently, the social import of a safety code goes much farther than safety alone, the public interest lying in the direction of safety at the lowest possible cost without disruption of labor or other elements of the social structure.

You have pointed to a lack of knowledge as a reason for delay and hesitancy in code recognition. Do not the social obligations of code making warrant the code committee in actively using the extensive facilities at its command to develop knowledge on the safety of proposed equipment and impartially modify the code in the public interest in accordance with its findings, without waiting until modifications are virtually forced on it?

In your closing paragraph you indorse this viewpoint as a secondary consideration with the statement, "On the other hand, we do believe that those elements (price, labor, sales) are strong reasons why code makers should do everything in their power to find ways and means safely to use the proposed equipment," but is not this the primary public interest? In your editorial this is merely a matter of emphasis, but the emphasis reflects the broad policy involved.

H. C. DANIELS,
Woodbury, Conn.

Give Utility Management in Columbia Extension

Fifty-seven courses in engineering will be given in the Extension Division of Columbia University during the 1939–40 academic year, according to an announcement by Dean Joseph W. Barker of the School of Engineering.

In addition to the electrical engineering courses, a course on "Operation and Management of Public Utilities" will be given by Prof. R. T. Livingston. Two special courses in air conditioning, one concerned with equipment and design, and the other with the theories of thermodynamics, will be conducted.

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New Utility Chart

The sixth public utility chart has been published by Robert A. Burrows, statistician, First National Bank Building, Pittsburgh, Pa. The new 1939 chart is the first revision since the one published in 1936 and shows the service area maps of the principal public utility systems in the United States. These maps are co-ordinated with the detailed financial data.

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